action area. The environmental baseline is a snapshot of the factors affecting the species and includes federal, state, tribal, local, and private actions already affecting the species, or that will occur contemporaneously with the consultation in progress. Unrelated, future federal actions affecting the same species that have completed formal or informal consultation are also part of the environmental baseline, as are implemented and ongoing federal and other actions within the action area that may benefit listed species.

6.1 Status of Listed Species in the Action Area

Sea turtles found in the action area may travel widely throughout the Atlantic, GOM, and Caribbean Sea; therefore, individuals found in the action area can potentially be affected by activities anywhere within this wide range.

Leatherback Sea Turtle

The leatherback is the most abundant sea turtle in waters over the northern GOM continental slope (Mullin and Hoggard 2000). Leatherbacks appear to spatially use both continental shelf and slope habitats in the GOM (Fritts et al. 1983, Collard 1990), but primarily utilize pelagic waters >200 m (Davis and Fargion 1996) throughout the northern GOM. Recent surveys suggest that the region from the Mississippi Canyon to DeSoto Canyon, especially near the shelf edge, appears to be an important habitat for leatherbacks (Mullin and Hoggard 2000). Surveys of sea turtles in the eastern GOM reported densities of 0.0026 individuals/km^2 (95 percent CI = 0.0004 - 0.0140) in 0-10 fathoms and 0.0029 individuals/km^2 (95 percent CI = 0.0015 - 0.0057) in 10-40 fathoms (Epperly et al. 2002). Leatherbacks are year-round inhabitants in the GOM with frequent sightings during both summer and winter (Mullin and Hoggard 2000). Temporal variability and abundance suggest that specific areas may be important to this species, either seasonally or for short periods of time.

Green Sea Turtle

Green sea turtles are found throughout the GOM. They occur in small numbers over seagrass beds along the south Texas and the Florida GOM coasts. Areas known as important feeding areas include the Homosassa River, Crystal River, and Cedar Key, Florida, and seagrass meadows and algae-laden jetties along the Texas coast. Sea turtle surveys in the eastern GOM have reported densities of 0.0021 individuals/km^2 (95 percent CI = 0.0006 - 0.0075) in 0-10 fathoms and 0.0137 individuals/km^2 (95 percent CI = 0.0060 - 0.0317) in 10-40 fathoms (Epperly et al. 2002).

Kemp's Ridley Sea Turtle

The nearshore waters of the GOM are believed to provide important developmental habitat for juvenile Kemp's ridley sea turtles. Ogren (1988) suggests that the GOM coast, from Port Aransas, Texas, through Cedar Key, Florida, represents the primary habitat for subadult ridleys in the northern GOM. This species generally remains within the 50-m isobath of coastal areas throughout the GOM (Renaud 2001). Surveys of sea turtles in the eastern GOM reported densities of 0.0079 individuals/km^2 (95 percent CI = 0.0030 - 0.0207) in 0-10 fathoms and 0.0011 individuals/km^2 (95 percent CI = 0.0004 - 0.0035) in 10-40 fathoms (Epperly et al. 2002). Stomach contents from Kemp's ridleys also indicate a nearshore distribution by their prey distribution which is consistent with other

reported density estimates of 0.065 turtles per km^2 in 0-10 fathoms compared to a decrease of 0.013 turtles per km^2 in 10-40 fathoms (Epperly et al. 2002).

Loggerhead Sea Turtle

The nearshore waters of the GOM are believed to provide important developmental habitat for loggerhead sea turtles. Loggerhead nesting along the GOM coast occurs primarily along the Florida Panhandle, although some nesting has been reported from Texas through Alabama as well (NMFS and FWS 1991b). Surveys of sea turtles in the eastern GOM resulted in reported densities of 0.0532 individuals/km^2 (95 percent CI = 0.0295 - 0.0961) in 0-10 fathoms and 0.0452 individuals/km^2 (95 percent CI = 0.0233 - 0.0880) in 10-40 fathoms (Epperly et al. 2002). Loggerhead abundance does not appear to be significantly different between winter and summer months over shelf waters in the GOM (Davis et al. 2000a, 200b). Although loggerheads are widely distributed during both summer and winter, their abundance in surface waters over the continental slope may be greater during winter than in summer (Mullin and Hoggard 2000), and many sightings occurred near the 100-m isobath (Davis et al. 2000a, 200b). Sightings of loggerheads in waters over the continental slope suggest that they may be in transit through these waters to distant foraging sites or seeking warmer waters during the winter. The majority of sightings have occurred in waters over the continental shelf, although many sightings have been reported over the continental slope.

In addition to some distribution over the slope waters, surface sightings of this species have also been made over the outer slope, approaching the 2,000-m isobath. Loggerheads found in deep waters may be traveling to distant nesting beaches, traveling between forage sites on distant and disjunct areas of the continental shelf, or seeking warmer waters during winter (Davis et al. 2000a, 200b).

Sperm whale

Sperm whale pods have been observed throughout the GOM from the upper continental slope near the 100-m isobath to the seaward extent of the United States EEZ and beyond, from sightings data collected from NOAA cruises from 1991 to 2000 (Roden and Mullin 2000, Baumgartner et al. 2001, Burks et al. 2001). Based on NOAA surveys, opportunistic sightings, whaling catches, and stranding records, sperm whales in the GOM occur year-round. Sperm whales appear to favor water depths of about 1,000 m and appear to be concentrated in at least two geographic regions of the Northern GOM: an area off the Dry Tortugas and offshore of the Mississippi River delta (Maze-Foley and Mullin 2006); however, distribution also appears influenced by occurrence and movement of cyclonic/anti-cyclonic currents in the GOM. Davis et al. (2000a) noted the presence of a resident, breeding population of endangered sperm whales within 50 km of the Mississippi River Delta and suggested that this area may be essential habitat for sperm whales. The Southeast United States Marine Mammal Stranding Network received reports of 17 sperm whales that stranded along the GOM coastline from 1987 to 2003 in areas ranging from Pinellas County, Florida, to Matagorda County, Texas. The GOM sperm whale abundance has most recently been estimated at 1,349 whales (CV = 0.23) (Mullin and Fulling 2003), calculated from an average of estimates from surveys conducted between 1996 and 2001.

The GOM stock is comprised of mostly females and calves, although large mature bulls have been recently sighted in the GOM. Based on seasonal aerial surveys, sperm whales are present in the northern GOM in all seasons, but sightings in the northern GOM are more common during the summer months (Davis et al. 2000a). Based on recent survey efforts, sperm whales concentrations are regularly sighted, and the boundaries of these areas of concentration in the Northern GOM appear to be approximately 86.5°W to 90.0°W, north of 27.0°N (Mullin 2002), and off southern Florida in an area approximately 86.5°W to 85.5°W, 24.0°N to 26.0°N (Mullin 2002); however, sperm whales have been reported throughout the GOM in waters greater than 200 m.

Recent research on the genetic stock structure of GOM sperm whales, gender composition, and kinship patterns during 2000, 2001 and 2002 indicate a distinct matrilineal population structure of sperm whales in the GOM (Engelhaupt pers. comm. 2003). In this study, 89 individuals (including satellite-tagged, D-tag tagged, opportunistic, and stranded whales) were genotyped using both mtDNA and microsatellite techniques and gender determined using molecular sexing techniques. The majority of whales sampled from groups throughout the north-central GOM fit the classic 'mixed' group scenario, comprised of females and subadults of both sexes. A comparative analysis of matrilineal ntDNA and biparentally inherited nuclear genetic markers has begun to show population structure for these female lineages. Only four mtDNA haplotypes were found in the northern Gulf, with two being unique on a global scale to this geographic area.

Gulf Sturgeon

The Gulf sturgeon is found in the GOM primarily from Tampa Bay, Florida west to the mouth of the Mississippi River. The action area includes the entire geographic range of the species, all five genetically distinct Gulf sturgeon river-specific stocks, and winter habitat for all known (seven) reproducing riverine populations.

Gulf sturgeon will be present in the project area from about September through May; they are not likely to be present in the project area in the summer (approximately May to September) when they are upstream at spawning areas. Upstream migration from the estuarine/marine area to riverine spawning areas occurs in early spring (i.e., March through May) when river water temperatures range from 16° to 23°C (Huff 1975, Carr 1983, Wooley and Crateau 1985, Odenkirk 1989, Clugston et al. 1995, Foster and Clugston 1997, Fox and Hightower 1998, Sulak and Clugston 1999, Fox et al. 2000). Fall downstream migration from the river into the estuary/marine environment is cued by water temperature (around 23°C), generally beginning in September and continuing through November (Huff 1975, Wooley and Crateau 1985, Foster and Clugston 1997).

Gulf sturgeon use the lower riverine, estuarine, and marine environment from about September through May for feeding and migration. Following a period of fasting in the river, the Gulf sturgeon are presumed to begin foraging as soon as they enter suitable brackish and marine habitat; they have been located in seagrass and sand in depths of 1.5 to 5. 9 m (Fox and Hightower 1998, Craft et al. 2001, Parauka et al. in press) which supports a variety of potential prey items including estuarine crustaceans, small bivalve

mollusks, and lancelets (Menzel 1971, Abele 1986, AFS 1989). In the estuarine/marine environment, Gulf sturgeon must consume sufficient prey to not only regain the body weight lost during the summer in the riverine environment, they must also obtain enough energy necessary for growth and reproduction (Fox et al. 2002, Murie and Parkyn pers. comm.). In addition to foraging, the Gulf sturgeon are migrating within the project area between habitats and, more rarely, between rivers.

6.2 Federal Actions

In recent years, NMFS has undertaken numerous ESA section 7 consultations to address the effects of federally-permitted fisheries and other federal actions on threatened and endangered listed species in the action area. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on listed species. Similarly, recovery actions NMFS has undertaken under the ESA are addressing the problem of take of listed species in the fishing and shipping industries and other activities such as COE dredging operations. The summary below of anticipated sources of incidental take of listed species from federal actions includes only those actions which have already concluded or are currently undergoing formal section 7 consultation.

Fisheries

Adverse effects on threatened and endangered sea turtles from several types of fishing gear occur in the action area. These gears, including gillnet, hook-and-line (i.e., vertical line), and trawl gear have all been documented as interacting with sea turtles. For all fisheries for which there is a fishery management plan (FMP) or for which any federal action is taken to manage that fishery, the impacts have been evaluated via section 7 consultation. Formal section 7 consultations have been conducted on the following fisheries: the HMS shark fishery and the southeast shrimp trawl fishery. An ITS has been issued for the take of sea turtles in each of the fisheries. A summary of each consultation is provided below but more detailed information can be found in the respective biological opinions (NMFS 2001b; NMFS 2002; NMFS 2003).

The Southeast shrimp trawl fishery affects more sea turtles than all other activities combined (NRC 1990). NMFS completed the biological opinion (NMFS 2002a) for shrimp trawling in the southeastern United States under proposed revisions to the TED regulations (68 FR 8456, February 21, 2003). This biological opinion determined that the shrimp trawl fishery under the revised TED regulations would not jeopardize the continued existence of any sea turtle species. This determination was based, in part, on the biological opinion's analysis that shows the revised TED regulations are expected to reduce shrimp trawl related mortality by 94 percent for loggerheads and 97 percent for leatherbacks.

GOM shark fisheries include commercial shark bottom longline and drift gillnet fisheries and recreational shark fisheries under the FMP for Atlantic Tunas, Swordfish, and Sharks (HMS FMP). The shark bottom longline and drift gillnet fisheries were both found likely to adversely affect sea turtles. An ESA section 7 consultation was completed on October 29, 2003, on the continued operation of those fisheries and the July 2003, Proposed Rule for Draft Amendment 1 to the HMS FMP (NMFS 2003a). The biological opinion

concluded the proposed action was not likely to jeopardize the continued existence of any listed sea turtles. An ITS was provided authorizing non-lethal takes.

On June 1, 2004, NMFS completed a biological opinion on the continued operation of the Atlantic HMS pelagic longline fishery and reef fish fishery in the Atlantic, GOM, and Caribbean under proposed rules changing gear and management measures to, among other things, require the use of only large circle hooks in the fishery. The biological opinion found that the continued prosecution of the pelagic longline fishery was likely to jeopardize the continued existence of leatherback sea turtles. However, NMFS implemented an RPA to allow for the continuation of the pelagic longline fishery without jeopardizing that species. The provisions of the RPA included measures to: (1) Reduce post-release mortality of leatherbacks; (2) improve monitoring of the effects of the fishery; (3) confirm the effectiveness of the hook and bait combinations that are required as part of the proposed action; and (4) take management action to avoid long-term elevations in leatherback takes or mortality. All other sea turtles were found not likely to be jeopardized. An ITS was provided.

On February 12, 2005, NMFS issued a biological opinion (NMFS 2005c) on the continued authorization of reef fish fishing under the GOM reef fish fishery management plan (RFFMP) and proposed amendment 23. The fishery uses three basic types of gear: spear and powerhead, trap and hook-and-line gear. Hook-and-line gear used in the fishery includes both commercial bottom longline and commercial and recreational vertical line (e.g., handline, bandit gear, rod and reel). The biological opinion concluded that loggerhead, leatherback, hawksbill, green, and Kemp's ridley sea turtles may be adversely affected by operation of the fishery and an ITS was provided. However, the proposed action was not expected to jeopardize the continued existence of any of these species.

Formal section 7 consultations have also been conducted for the issuance of several exempted fishing permits (EFP). These biological opinions have concluded the proposed activities may adversely affect but were not likely to jeopardize the continued existence of any sea turtles. ITSs for each EFP issued were provided.

Vessel Operation

Potential sources of adverse effects from federal vessel operations in the action area include operations of the U.S. Department of Defense (DOD), Navy (USN), Air Force and Coast Guard (USCG), the USEPA, NOAA, and the COE. The NMFS has conducted formal consultations with the USCG, the USN, and NOAA on their vessel operations. NMFS has also conducted section 7 consultations with vessel traffic related to energy projects in the GOM (MMS, FERC, and MARAD) to implement conservation measures. Through the section 7 process, where applicable, the NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. At the present time, however, they present the potential for some level of interaction. Private vessels participate in high-speed marine events concentrated in the southeastern United States and are a particular threat to sea turtles, and occasionally to marine mammals as well. The magnitude of these marine

events is not currently known. NMFS and the USCG (who permit these events) are in consultation on these events, but a thorough analysis has not been completed. Refer to the biological opinions for the USCG (NMFS 1995; NMFS 1996; NMFS 1998) and the USN (NMFS 1997a) for detail on the scope of vessel operations for these agencies and conservation measures being implemented as standard operating procedures.

Since the USN consultation only covered operations out of Mayport, Florida, potential still remains for USN vessels to adversely affect sea turtles when they are operating in other areas within the range of these species. Similarly, operations of vessels by other Federal agencies within the action area (NOAA, USEPA, COE) may adversely affect sea turtles. However, the in-water activities of those agencies are limited in scope, as they operate a limited number of vessels or are engaged in research/operational activities that are unlikely to contribute a large amount of risk.

Military Operations

The air space over the GOM is used extensively by the Department of Defense (DoD) for conducting various air-to-air and air-to-surface operations. Nine military warning areas and five water test areas are located within the GOM. The western GOM has four warning areas that are used for military operations. The areas total approximately 21 million acres (ac) or 58% of the area. In addition, six blocks in the western GOM are used by the Navy for mine warfare testing and training. The central GOM has five designated military warning areas that are used for military operations. These areas total approximately 11.3 million ac. Portions of the Eglin Water Test Areas (EWTA) comprise an additional 0.5 million ac in the Central Planning Area (CPA). The total 11.8 million ac is about 25% of the area of the CPA.

NMFS has recently completed four consultation on Eglin Air Force Base testing and training activities in the GOM. These activities have not been found to adversely Gulf sturgeon or sperm whales, but have concluded that the incidental take of sea turtles in likely to occur. These biological opinion have issued incidental take for these actions: loggerheads, Kemp's ridley, leatherback, and green sea turtles for the Eglin Gulf Test and Training Range (NMFS 2004c), the Precision Strike Weapons Tests (NMFS 2005a), and the Santa Rosa Island Mission Utilization Plan (NMFS 2005b); and loggerheads, a Kemp's ridley, and a green sea turtle for the Naval Explosive Ordnance Disposal School (NMFS 2004d). The USN Mine Warfare Center in Corpus Christi, Texas, may take, annually, up to five loggerheads and two leatherbacks, hawksbills, greens, or Kemp's ridleys, in combination, during training activities in the western GOM. Formal consultation on overall USCG or USN activities in the Gulf of Mexico has not been conducted.

Dredging

The construction and maintenance of Federal navigation channels has also been identified as a source of turtle mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move relatively rapidly (compared to sea turtle swimming speeds) and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes the slower moving turtle. A

regional opinion for the COE's Gulf of Mexico hopper dredging operations was completed in November 2003 (NMFS 2003b as last revised on January 9, 2007). The opinion concluded "no jeopardy" for sea turtles and Gulf sturgeon. An ITS was provided, as well as reasonable and prudent measures specified to minimize impacts included the use of temporal dredging windows, intake and overflow screening, the use of sea turtle deflector dragheads, observer and reporting requirements, and sea turtle relocation trawling.

ESA Permits

The ESA allows the issuance of permits to take ESA-listed species for the purposes of scientific research (section 10(a)(1)(a)). In addition, the ESA allows for the NMFS to enter into cooperative agreements with states developed under section 6 of the ESA, to assist in recovery actions of listed species. Prior to issuance of these authorizations, the proposal must be reviewed for compliance with section 7 of the ESA.

Sea turtles are the focus of research activities authorized by a section 10 permit under the ESA. There are currently 11 active scientific research permits directed toward sea turtles that are applicable to the action area of this biological opinion. Authorized activities range from photographing, weighing, and tagging sea turtles incidentally taken in fisheries, blood sampling, tissue sampling (biopsy), and performing laparoscopy on intentionally captured turtles. The number of authorized takes varies widely depending on the research and species involved but may involve the taking of hundreds of turtles annually. Most takes authorized under these permits are expected to be non-lethal. Before any research permit is issued, the proposal must be reviewed under the permit regulations (i.e., must show a benefit to the species). In addition, since issuance of the permit is a federal activity, issuance of the permit by the NMFS must also be reviewed for compliance with section 7(a)(2) of the ESA to ensure that issuance of the permit does not result in jeopardy to the species.

6.3 State or Private Actions

Vessel Traffic

Commercial traffic and recreational pursuits can have an adverse effect on marine mammals and sea turtles by direct physical impacts from vessel strikes, or by interactions with boat propellers.

State Fisheries

Several coastal state fisheries are known to incidentally take listed species, but information on these fisheries is sparse (NMFS 2001a). Various fishing methods used in these commercial and recreational fisheries, including trawling, pot fisheries, gillnets, and vertical line are all known to incidentally take sea turtles, but information on these fisheries is sparse (NMFS 2001a). Although the past and current effects of state fisheries on listed species are currently not determinable, the NMFS believes that ongoing fishing activities in state water, may in part, be responsible for seasonally high levels of observed strandings of sea turtles on South Atlantic coastlines. Most state data are based on extremely low observer coverage or sea turtles were not part of data collection; thus, these data provide insight into gear interactions that could occur but are not indicative of

the magnitude of the overall problem. The 2001 HMS biological opinion (NMFS 2001b) has an excellent summary of turtles taken in state fisheries through out the action area.

To address data gaps, several state agencies have initiated observer programs to collect information on interactions between listed species and certain gear types. Other states have closed nearshore waters to gear-types known to have high encounter rates with listed species. Depending on the fishery in question, many state permit holders also hold federal permits; therefore, existing section 7 consultations on federal fisheries may address some of the state fishery impacts. NMFS is also actively participating in a cooperative effort with Atlantic States Marine Fisheries Commission to standardize and/or implement programs to collect information on level of effort and bycatch in state fisheries.

Additional information on impact of take (i.e., associated mortality) is also needed for analysis of impacts to sea turtles from these fisheries. Certain gear types may have high levels of sea turtle takes, but very low rates of serious injury or mortality. For example, hook-and-line takes rarely are dead upon retrieval of gear, but trawls and gillnets frequently result in immediate mortality. Leatherbacks seem to be susceptible to a more restricted list of fisheries, while hardshell turtles, particularly loggerheads, seem to appear in data from almost all state fisheries. The HMS biological opinion also summarizes sea turtle interactions with flynets and various trawl techniques that occur within the action area.

Louisiana, Mississippi, Alabama, and Florida have placed restrictions on gillnet fisheries within state waters such that very little commercial gillnetting takes place in southeast waters.

Observations of state recreational fisheries have shown that loggerhead, leatherback, and green sea turtles are known to bite baited hooks, and loggerheads frequently ingest the hooks. Hooked turtles have been reported by the public fishing from boats, piers, and beach, banks, and jetties and from commercial fishermen fishing for reef fish and for sharks with both single rigs and bottom longlines (NMFS 2001b). A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the TEWG reports (1998, 2000).

Oil and Gas Activities

State oil and gas exploration, production, and development are expected to result in similar effects to protected species as reported in the analysis of federal activities for oil and gas lease sale biological opinions with the MMS, including impacts associated with the explosive removal of offshore structures, seismic exploration, marine debris, oil spills, and vessel operation.

6.4 Other Potential Sources of Impacts in the Environmental Baseline

A number of activities that may indirectly affect listed species in the action area of this consultation include ocean dumping and disposal, aquaculture, and anthropogenic marine debris. The impacts from these activities are difficult to measure. Where possible,

conservation actions are being implemented to monitor or study impacts from these sources. Close coordination is occurring through the section 7 process on both dredging and disposal sites to develop monitoring programs and ensure that vessel operators do not contribute to vessel-related impacts.

Marine Pollution

Sources of pollutants in the GOM coastal regions include atmospheric loading of pollutants such as PCBs, stormwater runoff from coastal towns, cities and villages, runoff into rivers emptying into the bays, groundwater and other discharges, and river input and runoff. Nutrient loading from land-based sources such as coastal community discharges is known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effects on larger embayments are unknown. Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986), the impacts of many other anthropogenic toxins have not been investigated.

Acoustic Impacts

NMFS has also been working to establish criteria to predict varying levels of responses of marine mammals to anthropogenic noise, based upon hearing injury and behavioral responses of marine mammals. Responses to noise exposure may include lethal or non-lethal injury, temporary hearing impairment, behavioral harassment and stress, or no apparent response. Ambient noise in the GOM is approximately 40 dB re 1 μPa above estimated baseline levels prior to industrialization, and it is expected to increase. Contributions to ambient noise levels include vessels; geophysical exploration; and the construction, operational, and decommissioning of offshore structures. It is expected that the policy on managing anthropogenic sound in the oceans will provide guidance for programs such as incidental harassment permits under the Marine Mammal Protection Act and permits for research involving sound-producing activities. NOAA is working cooperatively with the ship-building industry to find technologically-based solutions to reduce the amount of noise produced by commercial vessels. Through ESA consultation with NMFS, MMS has implemented GOM-wide measures to reduce the risk of harassment to sperm whales from noise produced by geological and geophysical surveying activities and the explosive removal of offshore structures.

Hypoxia

A large area of the Louisiana continental shelf with seasonally-depleted oxygen levels (< 2mg/l) is caused by eutrophication from both point and non-point sources. Most aquatic species cannot survive at such low oxygen levels and these areas are known as "dead zones." The oxygen depletion, referred to as hypoxia, begins in late spring, reaches a maximum in mid-summer, and disappears in the fall. After the Mississippi River flood of 1993, the spatial extent of this zone more than doubled in size, to over 18,000 km^2, and has remained about that size each year through mid-summer of 1997. The hypoxic zone has impacts on the animals found there, including sea turtles, and the ecosystem-level impacts continue to be investigated.

Natural Seeps

Naturally occurring hydrocarbon seepage has long been identified as a significant source of hydrocarbons. Tarballs coming from natural seeps were used by early indigenous man living along the GOM coast to construct hunting tools. Given that the GOM is a prolific petroleum-producing province, its seafloor is pocketed with areas from which oil and gas seep. Accurately calculating the volume of naturally seeping oil is problematic. Often the volume measured floating on the surface of the water or beached has been used as the best indicator of the volume originally seeped.

6.5 Conservation and Recovery Actions Shaping the Environmental Baseline

NMFS has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles in commercial fisheries. In particular, NMFS has required the use of TEDs in southeast U.S. shrimp trawls since 1989 and in summer flounder trawls in the mid-Atlantic area (south of Cape Charles, Virginia) since 1992. It has been estimated that TEDs exclude 97 percent of the sea turtles caught in such trawls. These regulations have been refined over the years to ensure that TED effectiveness is maximized through proper placement and installation, configuration (e.g., width of bar spacing), floatation, and more widespread use. Analyses by Epperly and Teas (2002) indicated that the minimum requirements for the escape opening dimensions in TEDs in use at that time were too small, and that as many as 47 percent of the loggerheads stranding annually along the Atlantic Seaboard and GOM were too large to fit through existing openings. On February 21, 2003, NMFS published a final rule to require larger escape openings in TEDs used in the Southeast shrimp trawl fishery (68 FR 8456, February 21, 2003). Based upon the analyses in Epperly et al. (2002), leatherback and loggerhead sea turtles will greatly benefit from the new regulations, with expected reductions of 97 percent and 94 percent, respectively, in mortality from shrimp trawling. Several states have regulations requiring the use of TEDs in state-regulated trawl fisheries, and the federal regulations also apply in state waters.

NMFS has also been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. As well as making this information widely available to all fishermen, NMFS recently conducted a number of workshops with Atlantic HMS pelagic longline fishermen to discuss bycatch issues including protected species, and to educate them regarding handling and release guidelines. NMFS intends to continue these outreach efforts and hopes to reach all fishermen participating in the Atlantic HMS pelagic longline fishery over the next one to two years. There is also an extensive network of STSSN participants along the Atlantic and GOM coasts who not only collect data on dead sea turtles, but also rescue and rehabilitate any live stranded sea turtles.

Loggerheads, leatherbacks, greens, and Kemp's ridleys are known to bite a baited hook, frequently ingesting the hook. Hooked turtles have been reported by the public fishing from boats, piers, beaches, banks, and jetties. Necropsies have revealed hooks internally, which often were the cause of death. NMFS currently is exploring adding questions about encounters with sea turtles to intercept interviews of recreational fishermen conducted by the Texas Parks and Wildlife Department under the auspices of the Marine

Recreational Fishery Statistics Surveys conducted throughout the GOM and along the Atlantic Coast as well as adding such information to the MRFSS database. NMFS is also considering questioning recreational fishermen aboard headboats throughout the southeast U.S. Atlantic and the GOM to quantify their encounters with sea turtles (TEWG 2000). Detailed summaries of the impact of hook-and-line incidental captures on loggerhead sea turtles can be found in the TEWG reports (1998, 2000).

The Recovery Plans for loggerhead and Kemp's ridley sea turtles are in the process of being updated. Recovery teams comprised of sea turtle experts have been convened and are currently working towards revising these plans based upon the latest and best available information.

7 EFFECTS OF THE ACTION

Regulations implementing section 7(a)(2) of the ESA requires biological opinions to evaluate the direct and indirect effects of federal actions to determine if it would be reasonable to expect them to appreciably reduce listed species' likelihood of surviving and recovering in the wild by reducing their reproduction, numbers, or distribution (16 U.S.C. '1536; 50 CFR 402.02). Section 7 of the ESA also requires biological opinions to determine if federal actions would destroy or adversely modify designated critical habitat (16 U.S.C. '1536).

In this section NMFS analyzes the adverse effects expected to occur as a result of the proposed five-year lease sale plan for the WPA and CPA. MMS actions will allow oil and gas operations to take place in association with the lease sales, with effects to the near-shore and offshore environments. A description of activities is provided in the Description of the Proposed Action section, and those effects that were considered, but determined to be insignificant or discountable appear in sections 3 and 4 of this biological opinion. The potential for Gulf sturgeon critical habitat to be adversely affected was considered in section 4.1.

Approach to the Assessment

The ESA requires biological opinions to include details of how the agency action affects listed species or their critical habitat along with the information that forms the basis of the biological opinion (16 U.S.C. 1536). Regulations that implement Section 7 of the ESA require biological opinions to include an evaluation of whether the action would be reasonably expected to appreciably reduce the likelihood of survival and recovery of listed species in the wild by reducing their reproduction, numbers, or distribution or would be reasonably expected to destroy or adversely modify critical habitat (50 CFR 402.02). We approach the analysis by identifying the probable direct and indirect effects of an action on the environment of the action area. In the second step, we assess the risk to individual animals (of listed species) from exposure to such changes in the environment, taking into consideration any potential responses of the animals, and then conduct an analysis to determine if any expected changes result in jeopardy to those populations of listed species.

7.1 Vessel Strikes

Sea turtles may be accidentally injured or killed by collisions with vessels over the 40-year life of operations resulting from the proposed action. As stated above, increased ship traffic could increase the probability of collisions between ships and sea turtles. Although there have been thousands of vessel trips that have been made in support of offshore operations during the past 40 years of OCS oil and gas operations, there have been no reports of OCS-related vessels having struck sea turtles. However, collisions with small and/or submerging turtles may go undetected, even with an observer onboard, and stranding records frequently document evidence of interactions such as cracked carapaces, missing limbs, and propeller cuts or scars. Sea turtles could, on occasion, be killed or injured by collisions with oil and gas service vessels.

In the wild, most adult sea turtles spend at least 3-6 % of their time at the surface for respiration. Despite the brevity of their respiratory phases, sea turtles sometimes spend as much as 26 % of their time at the surface, engaged in surface basking, feeding, orientation, and mating (Lutcavage et al. 1997). Sea turtles located in shallower waters have shorter surface intervals, whereas turtles occurring in deeper waters have longer surface intervals. Data show that vessel traffic is one cause of sea turtle mortality in the GOM (Lutcavage et al. 1997). Stranding data for the U.S. GOM and Atlantic coasts show that vessel-related injuries were noted in 13 % of stranded turtles examined during 1993 (Teas 1994), but this figure includes those that may have been struck by boats post-mortem. In Florida, where there are a high number of recreational vessels, the frequency of boat injuries between 1991 and 1993 was 18% of strandings (Lutcavage et al. 1997). Data indicate that live- and dead-stranded sea turtles showing signs of vessel-related injuries continue in a high percentage of stranded sea turtles in coastal regions of the southeastern United States.

Based on active leases as of April 2006, 55 percent of those leases occur in water depths greater than 200 m (3,606 occur on water depths from 0-200 m; 4,501 occur in water depth greater than 200 m). Due to the uncertainties in the factors affecting interactions between vessels and sea turtles, the following assumptions have been made to calculate the encounter rates in Table 5:

- sea turtle densities in Table 5;
- an average offshore supply vessel measuring 70 m x 16 m (0.0700 km x 0.0160 km);
- 100 percent of the maximum number of annual vessel trips will occur in water depths <200 m (238,000 trips)
- 55 percent of the maximum number of annual vessel trips will occur in water depths ≥200 m (130,900 trips);
- a random distribution of vessels and sea turtles;
- turtles are stationary at the surface; and
- a vessel may affect a sea turtle once per round trip.

Based on the above assumptions, the dimensions of a vessel is a rectangular-shaped space occupying a potential impact area of 0.0011 km^2 for a single vessel, a maximum

harassment area of 262 km^2 resulting from a total of 238,000 vessel trips annually in water depths <200 m, and an area of 144 km^2 resulting from 130,900 vessel trips annually in water depths ≥200 m. Based on sea turtle densities in the GOM, the greatest estimated annual encounter rates between vessels and sea turtles would be expected in water depths <200 m (Table 5). This estimate assumes a vessel is stationary; however, since vessels are underway between destinations, the probability for a randomly positioned, stationary sea turtle to be encountered may be expected to increase as a vessel moves through the water. The operating speeds and actual distances traveled by the annual number of vessel transits can be highly variable, and is therefore considered qualitatively in this analysis.

Table 5. Sea turtle densities in the GOM and estimates of encounters between vessels and sea turtles.

Species	Density (individuals km^{-2})	Annual Encounters	Encounters Over 40 Years
<200 m[a]			
leatherback	0.0026	0.6812	27.25
green	0.0142	3.7204	148.82
Kemp's ridley	0.0047	1.2314	49.26
loggerhead	0.0443	11.6066	464.26
hawksbill	0.0000	0.0000	0.00
>200 m[b]			
leatherback	0.0024	0.3456	13.82
green[c]	0.0005	0.0720	2.88
Kemp's ridley[c]	0.0005	0.0720	2.88
loggerhead	0.0020	0.2880	11.52

[a]Density estimates are upper confidence limits of greatest reported density in water depths <200 m of the western GOM reported in Epperly et al. 2002.
[b]Density estimates from seasonal averages reported in Davis et al. 2000b.
[c]Unidentified chelonids from Davis et al. 2000b are assumed to be Kemp's ridleys or greens sea turtles. Hawksbills are not expected to occur in deep water habitats are excluded from the >200 m analysis.

Table 5 provides an estimate of potential encounter rates with sea turtles based on the probability that one sea turtle will occupy the same space as a vessel during each vessel trip. Although sea turtles are not randomly distributed and may be expected to occur in greater densities in some regions than others, we consider the assumptions reasonable to estimate the potential risk of vessels strikes with sea turtles on an annual basis. The distribution of sea turtles may be affected by a variety of biotic and abiotic factors, including season, water temperature, prey distribution, and life history stage. These factors may significantly affect where and when sea turtles may be encountered in the GOM. In reality, both sea turtles and vessels may have the opportunity to avoid one another and encounter rates may be highly variable. When underway vessels do come upon sea turtles, sea turtles may respond by swimming away at the surface or diving and vessels may take prudent actions to avoid striking an animal. Avoidance behavior by sea

turtles is advantageous to avoid being struck, and avoidance behavior is expected to be insignificant on both the individual and the population; however, a few individuals would be expected to be at risk of injury or mortality over the lifetime of the action (Table 5).

To reduce the risk of potential injury and mortality resulting from vessel collisions with sea turtles, MMS will implement NMFS' vessel strike avoidance measures for protected species, as implemented in MMS NTL 2007-G04. With implementation of these measures, by maintaining a lookout for sea turtles and taking prudent actions to avoid collisions with them, NMFS believes that the likelihood of collisions between vessels and sea turtles will be reduced. However, due to nighttime operation of vessels and the small size of sea turtles, some individuals may go unobserved and may be accidentally struck by an underway vessel.

The following take estimates are based on the assumptions in the risk analysis conducted, and the following considerations. Although vessel operators are required to maintain a watch for and avoid sea turtles, NMFS estimates sightings will be reduced by 55 percent due to darkness, and reduced an additional 20 percent due to poor sea state and visibility, and other factors such as operator fatigue resulting in sea turtles going unobserved. The magnitude of the impact on vessel-struck sea turtles may range from minor annoyance to injury, or death, which is dependent on the speed of the vessel, depth of the turtle, and angle of impact. Due to the variable operational speeds and conditions under which animals may be struck, we estimate that 1/3 of vessels striking sea turtles will result in mortality. Based on the greatest encounter rate for each species calculated in Table 5, a detection and collision avoidance rate of 25%, and estimate that 1/3 of all strikes will be lethal the incidental take of each sea turtle species by vessel strike over 40-years of the proposed lease sales is calculate as follows:

Species	Encounters Over 40 Years	Number at Risk of Strike	Non-Lethal Take	Lethal Take
leatherback	41	31	21	10
green	152	114	76	38
Kemp's ridley	52	39	26	13
loggerhead	476	357	238	119
hawksbill	3	2	1	1

Numbers with decimal places >0.50 were rounded to the next nearest whole number.

7.2 Geological and Geophysical Surveys

NMFS has completed two biological opinions on seismic surveys occurring in the WPA and CPA of the GOM (NMFS 2002b and 2002c) and most recently for lease sales occurring in the Eastern Planning Area (NMFS 2003c) and are incorporated by reference in the following analysis. In these biological opinions we anticipated incidental takes of sperm whales, but an incidental take statement was not included for sperm whales since a take authorization has not yet been issued under Section 101(a) (5) of the MMPA. On December 26, 2002, the MMS submitted a request for 5-year regulations under the MMPA for the taking, by harassment, of sperm whales incidental to oil and gas

industry's seismic surveys to discover oil and gas deposits offshore in the GOM. NMFS published an Advance Notice of Proposed Rulemaking regarding the small take authorization on March 3, 2003 (68 FR 9991). Following issuance of such regulations under the MMPA, NMFS intends to estimate the number of potential takes of sperm whales and authorize any take that may be necessary. Seismic surveys associated with the proposed lease sales occur in deep, offshore waters of the OCS that is well outside the range of Gulf sturgeon; therefore, the effects of seismic surveys on this species are not considered further.

7.2.1 Effects of Seismic Surveys on Sperm Whales

The received sound level resulting in behavioral changes (and harassment) has not been measured in sperm whales, but do not expect the received level to be lower than that of baleen whales. Unlike baleen whales, sperm whales are not likely to be low-frequency specialists, but are believed to be most sensitive in the mid-frequency hearing range (Madsen et al. 2002). Low frequency sounds travel further distances than higher frequency sounds, resulting in a greater potential of disturbance for baleen whales.

Previous biological opinions, herein incorporated by reference, have considered the potential for sperm whales to experience hearing loss, disturbance, habituation, sensitization, and masking with exposure to seismic surveys. There is no new information available from the date of those biological opinions that would alter the conclusions of those biological opinions and summarized below. The proposed action would result in multiple seismic surveys in the lease sale areas, which overlap with known habitat and presence of sperm whales. We believe that permanent hearing loss (permanent threshold shift or PTS) is unlikely to occur given that seismic survey operators would continue to implement the seismic minimization measures according to the MMS Notice to Lessees. Masking also would be unlikely to occur due to the characteristics of the airgun pulses. The primary concerns are with the potential for temporary hearing loss, important sperm whale behaviors to be disrupted, cow-calf pair disturbance, habituation to seismic pulses, and possible effects to their prey. Given that a seismic survey could be conducted over a broad area for weeks or months, a social group that remains in a particular location would be repeatedly exposed to airgun pulses at a variety of received levels. This exposure could result in repeated disruptions to a group that is caring for a calf or some reduction in feeding due to prey relocations or the disruption of a sperm whale's hunt. Exposed sperm whales may also be subject to some level of stress that is not evident or observable through any changes in behavior. Though the available information indicates that some avoidance or disturbance from airgun noise is possible, the reported observations do not indicate that any immediate physical injury is occurring. Furthermore, seismic surveys have been conducted in the proposed lease sale area and other parts of the northern GOM, yet sperm whales continue to be present there and their population appears to be stable. If behavioral disruptions do occur during seismic surveys, we expect that the disruption would be limited to the duration of exposure to the noise, which may be highly variable.

The nutritional status of females is linked to annual calf production in whales and other animals. A reduction in hearing ability, prey availability, or hunting success could likely

affect milk production and nutritional status of lactating females, and depending on the level of disruption, calf production could possibly be reduced in any given year depending on the number and duration of seismic surveys. This further highlights the continued importance of implementation of MMS's NTL No. 2007-G02.

Summary of Effects on Sperm Whales
In summary, sperm whales are expected to be harassed through disruption of important biological behaviors as a result of the use of airguns in seismic surveys associated with the proposed action and these behavioral responses are likely to result in a biological effect which may adversely affect sperm whales. However, the continued implementation of the impact minimization measures from seismic surveys in MMS's NTL (APPENDIX A) is expected to reduce this harassment and to prevent this harassment from resulting in actual loss of individual sperm whales.

7.3 Oil spills

Offshore oil spills associated with a proposed action can result from platform accidents, pipeline breaks, or navigation accidents. Coastal oil spills can result from storage, barge, or pipeline accidents. The most likely locations of coastal spills are at pipeline terminals and other shore bases, oil spills have been described in the GOM (Bedinger et. al 1982, Van Vleet and Pauly 1987, Van Vleet et al. 1984). Spills from support vessels could occur from navigation accidents and will be largely confined in navigation channels and canals. Slicks may quickly spread through the channel by tidal, wind, and traffic (vessel) currents. The severity of the effects of an oil spill on listed species would be related to the location of the spill, the type of oil, the level of contact with the oil that the whales, turtles or fish have, and the life stage of the animal encountering the oil.

The following analysis first considers the potential effects to sea turtles, Gulf sturgeon, and sperm whales from accidental oil spills, and then considers MMS' oil spill risk analysis (OSRA). Using the results of the OSRA, the probable likelihood of oil spills occurring in each species habitat is determined. Oil spill trajectory simulations are generated by MMS to be used to estimate spill risk. The MMS uses a numerical computer model that simulates the likely trajectory of a surface slick, represented as a point launched from locations projected onto a gridded area. The point's trajectory simulates a spill's movement on the surface of water by using modeled ocean current and wind fields. The model uses temporally and spatially varying, numerically computed ocean currents and winds. Finally, the number of exposures to each species is estimated, and the potential for take resulting from those exposures is evaluated.

7.3.1 Effects on Sea Turtles

Spilled oil could affect any life history stage or age class of sea turtles (Vargo et. al 1986). Offshore and coastal spills could affect any species or age class of sea turtle coming into contact with a slick. Direct contact would continue to occur for as long as the slick persists, but physiological effects could continue for long periods once the slick diminishes. If a sea turtle were not directly exposed to a slick, hydrocarbons continue to persist in the sea for decades or longer. Tarballs are a byproduct of accidentally spilled oil, normal and accepted ship operations (e.g., bilge tank flushing), illegal discharges

from tank washings, and natural oil seeps on the seafloor. They are found in every ocean and on every beach; features such as convergence zones and Langmuir cells can aggregate even widely dispersed tarballs into an area where sea turtles concentrate. USFWS biologists from Texas recently commented to MMS that they are still finding tarballs, probably from the *Ixtoc* oil spill in Mexico that occurred decades ago, washing up on Padre Island National Seashore. Tarballs ingested by any age class of sea turtle are likely to have a variety of effects, including starvation from gut blockage, decreased absorption efficiency, absorption of toxins, effects of general intestinal blockage (such as local necrosis or ulceration), interference with fat metabolism, and buoyancy problems caused by the buildup of fermentation gases (floating prevents turtles from feeding and increases their vulnerability to predators and boats), among others.

Effects of Oil on Sea Turtle Nesting

Spilled oil reaching a sea turtle nesting beach could have affects on nesting sea turtles and egg development. An oiled beach could affect nest site selection or result in no nesting at all (e.g., false crawls). A nesting sea turtle crawling up a beach could result in external oiling of the skin and carapace. Upon successful nesting, some indirect effects of beach oiling could result in changed sex ratios on a nesting beach. Hays et al. (2001) determined that subtle differences in sand color or albedo can significantly affect underlying temperatures. Because sex determination in turtles is temperature-dependent, shifts in albedo could potentially change hatchling sex ratios. Even light surface oiling that does not penetrate directly to the eggs could therefore affect gender distribution in a population. To simulate heavier beach oiling, Fritts and McGehee (1982) conducted laboratory studies by exposing eggs to fresh oil during the last half to last quarter of the incubation period. Oil-exposed eggs showed a significant lower rate of egg survival, than eggs that were not exposed to oil. Weathered oil appeared to lose its toxic effect on eggs and it was concluded that oil spilled even a few weeks prior to the nesting season would have little effect on successful egg development.

Effects of Oil on Hatchlings

Upon hatching and successfully reaching the water, hatchlings are subject to the same types of oil spill exposure hazards as adults. Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects, from acute toxicity to impaired movement and normal bodily functions. However, differences in size and behavior increase the risk of oils spills on hatchlings. Most reports of oiled hatchlings originate from convergence zones, ocean areas where currents meet to form collection points for material at or near the surface of the water. These zones aggregate oil slicks as well as smaller, weaker sea turtles. Because hatchlings spend a greater proportion of their time at the surface than adults, their risk of exposure to floating oil slicks would be increased.

In convergence zones off the east coast of Florida, tar was found in the mouths, esophagi, or stomachs of 65 out of 103 post-hatchling loggerheads (Loehefener et al. 1989). In another study (Witherington 1994), 34 percent of post-hatchlings at "weed lines" off the Florida coast had tar in their mouths or esophagi, and over half had tar caked in their jaws. Lutz (1989) reported that hatchlings have been found apparently starved to death, their beaks and esophagi blocked with tarballs. Hatchlings sticky with oil residue may

have a more difficult time crawling and swimming, rendering them more vulnerable to predation.

Effects of Oil on Sea Turtle Juveniles and Adults
Studies of oil effects on loggerheads in a controlled setting (Lutcavage et al. 1995) suggest that sea turtles show no avoidance behavior when they encounter an oil slick and any sea turtle in an affected area would be expected to be exposed. Sea turtles' diving behaviors also puts them at risk. Sea turtles rapidly inhale a large volume of air before diving and continually resurface over time that may result in repeated exposure to volatile vapors and oiling.

Lutcavage et al. (1995) studies provided qualitative evidence that oil exposure disrupted lachrymal gland (salt gland) function, in which the glands physiologically did not function for several days. Experiments on physiological and clinicopathological effects of oil on loggerhead sea turtles approximately 15 to 18 months old showed that the turtles' major physiological systems are adversely affected by both chronic and acute exposures (96-hour exposure to a 0.05-cm layer of South Louisiana crude oil versus 0.5 cm for 48 hours). The skin of exposed turtles, particularly the soft pliable areas of the neck and flippers, sloughed off in layers for up to 2 weeks and recovery taking up to 3 weeks. Oil was also detected in the nares, eyes, upper esophagus, and feces, indicating that turtles were ingesting oil, though apparently not enough to cause intestinal bleeding and anemia. Internal effects of oil exposure also include significant changes in blood and blood chemistry. Hematocrits (red blood cell volume) decreased nearly 50 percent in oiled turtles and did not increase again during the recovery period. An immune response indicated by significant increases in white blood cells lasted more than a week in sea turtles exposed to oil.

Turtles also indiscriminately eat anything that registers as being an appropriate size for food, including tarballs. Oil ingested by a turtle does not pass rapidly through its digestive tract. It may be retained for several days, increasing internal contact and the likelihood that toxic compounds will be absorbed. The risk of gut impaction also increases for turtles that have ingested oil.

Risk of Oil Spills in Sea Turtle Habitat
To their widespread distribution throughout the GOM, and life history stages on both beach and marine environments, sea turtles have a high potential to be affected by an oil spill resulting from the proposed lease sales. Sea turtle habitat in the GOM includes inshore, shelf, and oceanic waters, as well as numerous beaches in the region. Based on the OSRA, many, frequent, small spills; few, infrequent, moderate-sized spills; and a single, unlikely, large spill have been estimated.

In nearshore waters of the WPA, spill estimates indicate that spills <42 U.S. gallons (gal) (42 U.S. gallons = 1 bbl) will introduce 546-1,218 gal of oil into coastal waters over the 40-year life of the proposed lease sales. Spills >42 gal and <42,000 gal of oil are expected to introduce 6,426-12,852 gal of oil in coastal waters of the WPA. A single

spill >42,000 gal of oil may occur and the total volume of spilled oil introduced into coastal waters of the WPA ranges from 6,972-140,070 gal.

In nearshore waters of the CPA, spill estimates indicate that between 42 and 92 spills of <42 gal of oil will be introduced into coastal waters. An additional 12,852-32,004 gal of oil are estimated to be spilled into coastal waters of the CPA from spills of >42 to <42,000 gal. A total of 14,616-161,868 gal of spilled oil is estimated for coastal waters of the CPA.

In offshore waters of the WPA, estimates from spill data indicate many frequent small spills (<42 gal); few, infrequent, moderately-sized spills (>42 gal and <42,000 gal); and/ or rare large spills as a result of the proposed actions. An estimated 2,394-4,158 gal of oil will be introduced in offshore waters from small spills (<42 gal). An additional 15,582-52,290 gal of oil will be spilled in quantities of a >42 to <42,000 gal spill event. A single, large spill (>42,000 gal) is estimated to introduce approximately 193,200 gal of oil. A single, but unlikely, spill may occur that introduces as much as 630,000 gal of oil. The total volume of oil spilled in offshore waters as a result of the proposed actions in the WPA is estimated at 15,582-875,490 gal of oil spread over the 40-year life span of the proposed actions. In offshore waters of the CPA, small spills (<42 gal) are projected to introduce 7,644-12,768 gal of oil. Moderate-sized spills (>42 and <42,000 gal), though occurring less frequently than smaller spills, will introduce an estimated 37,128-86,982 gal of oil. One or two large spills (>42,000 gal) are assumed to introduce approximately 193,200-386,400 gal of oil as a result of proposed actions in the CPA. In the rare event that a spill exceeding 420,000 gal should occur, it is estimated that approximately 630,000 gal of oil will be spilled over the 40-year lifetime of the proposed leases in the CPA.

7.3.2 Effects of Oil on Sperm Whales

A large accidental spill may impact sperm whales in the GOM. Because the of the matriarchal social structure of sperm whales, an accidental oil spill affecting sperm whales could potentially affect the whole group in the area, including adult females, calves, and juveniles of either sex. Sperm whales are deep divers and generally forage over large areas so that the magnitude of oil exposure would depend, in part, on the location of the spill, the composition of the spilled material, and the movement and fate of the spilled hydrocarbons/wastes in the offshore environment. Spilled hydrocarbons could affect sperm whales through various pathways including surface contact, oil inhalation, and oil ingestion. Direct contact with oil can result in irritation and damage to skin and soft tissues of cetaceans. Hydrocarbons absorbed in the blood stream may accumulate in the brain and liver and result in neurological disorders. Sperm whales in the GOM could be exposed to residuals of oils spilled as a result of proposed actions over the life of the lease resulting from the proposed lease sales.

Risk of Oil Spills in Sperm Whale Habitat

Blowouts, oil spills, and spill-response activities have the potential to adversely affect sperm whales in the offshore environment. There are 1-2 blowouts projected to occur from a proposed lease sale in the WPA and 2-3 blowouts projected from a proposed lease

sale in the CPA. It is expected that slicks from spills <42,000 gal will persist a few minutes (<42 gal), a few hours (<420 gal), or a few days (420-42,000 gal) on the open ocean. Large spills, particularly those continuing to flow fresh hydrocarbons into oceanic and/or outer shelf waters for extended periods (days, weeks, months), pose an increased likelihood of impacting cetacean populations inhabiting these waters. Oil-spill data derived from historical trends estimate that a total volume of 237,972-1,116,150 gal of oil will be introduced into federal offshore waters over 40 years as a result of the proposed lease sales in the CPA. Small spills (<42 gal) are projected to introduce 7,644-12,768 gal of oil. Moderate-sized spills (>42 and <42,000 gal), though occurring less frequently than smaller spills, will introduce an estimated 37,128-86,982 gal of oil. One or two large spills (>42,000 gal) are assumed to introduce approximately 193,200-386,400 gal of oil as a result of proposed actions in the CPA. In the rare event that a spill exceeding 420,000 gal should occur, it is estimated that approximately 630,000 gal of oil will be spilled. Spilled oil would rapidly spread out, evaporate, and weather, quickly becoming dispersed into the water column. Potential effects include physical injury and irritation, respiratory stress from inhalation of toxic fumes, food reduction or contamination, direct ingestion of oil and/or tar, and temporary displacement from preferred habitats.

7.3.3 Effects of Oil on Gulf Sturgeon

The risk of exposure of Gulf sturgeon to such a spill would be dependent upon the species abundance in the area affected by a spill, as well as the size and persistence of the slick. Oil spill probability models were run for Gulf sturgeon critical habitat and for a swath from the mouth of the Mississippi River to Tampa Bay for known Gulf sturgeon locations. The Gulf sturgeon is an anadromous fish; adults spawn in freshwater then migrate to feed and grow in estuarine/marine habitats. After spawning in the upper river reaches, both adult and subadult Gulf sturgeon migrate to the estuaries, bays, and the GOM and return to the coastal rivers in early spring (i.e., March through May) when river water temperatures range from 16°C to 23°C (Huff 1975, Carr 1983, Wooley and Crateau 1985, Odenkirk 1989, Clugston et al. 1995, Foster and Clugston 1997, Fox and Hightower 1998, Sulak and Clugston 1999, Fox et al. 2000). Surveys have located adult Gulf sturgeon in rivers predominantly in the summer months (May-August) with adults rare or absent in the rivers during fall and winter months when they migrate seaward into the adjacent estuarine and marine habitats (Craft et al. 2001, Berg 2004). Based on the life history of this species, subadult and adult would be most vulnerable to an estuarine or marine oil spill, and would only be vulnerable during winter months (between September 1 through April 30) when this species is foraging in estuarine and marine habitats.

Risk of Oil Spills in Gulf Sturgeon Habitat

The area analyzed for oil spill probability is the area in which Gulf sturgeon are known to occur, from the Mississippi River to Charlotte Harbor in western Florida. This geographic range of Gulf sturgeon is larger than the designated critical habitat.

The inclusion of the eastern Louisiana portion differs from the oil spill analysis performed for critical habitat and results in different oil spill contact probabilities. Gulf sturgeon designated critical habitat does not include the Mississippi River delta (southeastern-most portion of Louisiana to the river mouth); resulting in greater risk of an

oil spill affecting Gulf sturgeon than their critical habitat. Based on the OSRA conducted for Gulf sturgeon, the area of the Mississippi River delta has the highest risk of being affected by an oil spill. There is a 6 to 9 percent chance that a spill >42,000 gal would occur as a result of a proposed action in the CPA and reach coastal waters of the delta region within 10 days.

7.3.4 Estimation of Exposure and Take from Oil Spills

Oil spills are rare events, but they have the potential to be devastating to the listed species in the area affected when they occur. The time, location, and size of an oil spill, and oil spill response activities may determine the potential impacts to listed species. Immediately upon being spilled, oil begins to weather, including the evaporation of volatile hydrocarbons, dissolution of soluble components, dispersion into the water column, emulsification and spreading at the water's surface.

The relative risk of exposure to smaller and larger sized slicks is very much dependent on the size of the slick, how long it lasts, and where and when it occurs. Many of the variables are highly unpredictable; however, the majority of spills (75.1 percent) and the majority of spills by volume (83.8 percent) occur within 3 nmi of shore. Such spills place species inhabiting nearshore environments, or occurring in greater densities, are at greater risk than offshore species.

Table 6. Mean number of spills expected over the 40-year lifetime of the proposed lease sales (data on spill size, spill area, and number of spills provided by MMS).

Median Spill Size (gal)	Spill Area at 24 hours (km^2)[a]	Maximum Number of Spills in WPA and CPA	Days Individual Slick Area Persists[b]	Total Spill Area (km^2) Over 40 Yrs
3	0.0000124	5,757	2	0.1427736
126	0.0005261	129	2	0.1357338
840	0.0040470	28	3	0.2266320
3,780	0.0809400	11	4	3.5613600
26,880	0.1133000	2	4	0.9064000
193,200	0.8094000	3	5	12.141000
Total	1.0082255	5,933	27	17.1138994

[a]The spill area is based on the projected maximum surface area of the slick. The slick will become thinner and smaller over time, and the actual number of days a slick will persist will vary depending on weathering and other factors.

[b]Estimate based volume of spilled oil and maximum spill area. Actual persistence of slicks may occur for longer periods, depending on volume, and is accounted for by applying the maximum slick area over a period of days.

Many small spills are expected to be common from the proposed action (Table 6). MMS estimates slicks from spills <42,000 gal will persist for a few minutes and would have little chance of directly contacting a listed species unless individuals were in the immediate area at the time of the spill. The amount of oil spilled from many small sources is potentially greater than that of a few larger-sized spills. However, it is not simply infrequent or episodic spills that threaten listed species, but also the continuous

low-level exposure to oil in the form of tarballs, small slicks, or elevated background concentrations also challenge animals facing other natural and anthropogenic stresses. Chronic exposure may not be lethal by itself, but it may impair an animal's overall fitness so that it is less able to withstand other stressors.

Larger spills greater than 420 gal would persist for days to over a week depending on the size and weathering of the slick. Although larger spills are expected to occur much less frequently (Table 6), these larger spills have the greatest potential to adversely affect listed species, and may result in more severe affects. MMS expects that approximately one major oil spill could occur over the 40 years of the proposed action.

Sea Turtles

Spills originating in or migrating through coastal waters of Texas or Louisiana may impact any of the five sea turtle species inhabiting the GOM. Spills occurring in offshore waters would be expected to have less a chance of affecting sea turtles due to their lower densities in deep water; however, leatherback sea turtles may be expected to have a greater risk of adverse effects in offshore environments than nearshore environments. Takes from oil spills may be lethal or non-lethal ranging from a wide array of effects including changes in biologically important behaviors to mortality. It has been estimated that approximately 1 percent of annual sea turtle strandings are associated with oil. Higher percentages are attributed to oil in South Florida (3 percent) and Texas (3 to 6 percent) (Lutcavage et al. 1997). Oil removed from stranded sea turtles in Florida and Texas has been identified primarily as tanker discharges, not the result of accidental spills.

Based on projected spill estimates, there is a small risk that an individual sea turtle will encounter a single small oil slick that does not persist long in the environment. Long-term exposure to contaminants from many small oil spills may play a cumulative role, but these potential effects are mostly unknown at this time. Small spills are expected to be much more numerous than large spills, but the fewer, larger slicks have a greater potential for adverse affects due to the increased chance that sea turtles will be exposed to large slicks over short periods due to its larger size and greater persistence in the environment than smaller slicks.

Because oil spills are unpredictable, we look to a catastrophic oil spill, the Ixtoc I oil spill in 1979, to estimate impacts. During this spill, prevailing northerly currents in the western Gulf of Mexico carried spilled oil toward the United States. A 60-mile by 70-mile patch of sheen containing a 300 ft by 500 ft patch of heavy crude moved toward the Texas coast. The heavy crude impacts a relatively small area and contributes to the sheen, tarballs, and other residuals through weathering. On August 6, 1979, tarballs from the spill impacted a 17 mile stretch of Texas beach. With new technologically advances and oil spill prevention and response plans, a major oil spill in the GOM would not likely be as large as Ixtoc I (Minerals Management Service 2006). In the following analysis we use one-half estimates of the approximate maximum spill area from Ixtoc I to estimate potential impacts from a major oil spill occurring as a result of the proposed action. It should be noted that this estimate likely applies to all oil and gas operations in the GOM

over a 40-year period, but the risk of any one action (i.e., a lease sale) must be assumed to be equal. Table 7 uses the following oil spill scenario and assumptions in the calculations:

- a 30-mile by 40-mile wide area would affect approximately 3,108 km^2 of ocean surface with oil sheen,
- a 150 ft by 250 ft area of heavy crude would affect 0.0035 km^2 of water,
- a 9-mile long by 3-mile wide stretch of coastal habitat affected by tarballs would impact approximately 70 km^2 of water, and
- individuals are assumed to be resident in the area during the duration of the spill so animals aren't repeatedly counted, but may be repeatedly exposed during the duration of the spill.

Table 7. One-day exposure estimates of sea turtles to a major oil slick occurring over the 40-year lifetime of the proposed lease sales.

Spill Area (km^2)[b]	leatherback (0.0026)	green (0.0142)	Kemp's ridley (0.0047)	loggerhead (0.0443)	hawksbill (0.0000)
3,108 (sheen)	8.08	44.13	14.61	137.68	<0.05
0.0035 (heavy crude)	<0.05	<0.05	<0.05	<0.05	<0.05
70 (tarballs)	0.18	1	0.33	3.10	<0.05

[a]Numbers in ( ) following each species name are upper confidence limits of greatest reported density in water depths <200 m of the western GOM reported in Epperly et al. 2002.

In the event an oil spill were to occur, the actual numbers of individuals affected would be dependent upon the size and location of the slick, the type of oil released, and the abundance of sea turtles in the area. Since tarballs may persist in the environment over a much longer period than the slick lasts, an additional number of turtles could potentially be adversely affected by tarball ingestion. Although direct exposure to heavy crude would likely be lethal due to heavy oiling of the entire body surface, the risk of exposure to heavy crude is very low due to the small surface area. Risk of exposure to the sheen is much greater due to the greater surface area of oil spreading across the surface the water.

Hatchlings and juveniles are expected to be more vulnerable to lethal effects of oil spills due to their increased time at the surface, smaller size, and lesser mobility than that of adults. Although short-term physiological effects may occur depending on the level and duration of exposure, most fatalities due to oiling are from covering of the mouth and nares (nostrils) that can prevent an animal from breathing if the individuals we not treated. Because the amount of oiling of hatchlings may vary depending on factors such as the thickness of the sheen at the surface, the duration of the spill, and whether or not the animals were recovered and rehabilitate during oil spill response, we expect approximately one-half of exposed hatchlings and juveniles to be killed due to a major oil spill. Lethality of adults would be expected to be much lower than that of hatchlings due to their greater size, strength, and mobility. Although short-term physiological effects have been shown to occur in adult sea turtles, we estimate that approximately 1 in 10 adults will suffer chronic affects resulting in death from a major oil spill.

The exposure estimates to a surface sheen of a given area are considered reliable since animals must surface to breathe. However, when considering tarball ingestion, tarballs will not be evenly distributed and a sea turtle must actually ingest the tarball to be affected such that exposure does not necessarily equate to a take. Addtionally, although tarballs may persist in the environment for unknown durations, making predictions of take by ingestion is problematic due to uncertainties in actually encounter rates during foraging, and whether the tarballs resulted from an accidental spill, or from other sources such as natural seeps and bilge water discharges. Due to the uncertainty regarding actually encounter rates between sea turtles and tarballs in the environment, we must rely on an approximate estimate that tarballs from a large oil spill would persist for 5 years and be encountered by any individual once per year.

Although the occurrence, size, time of year, and location of an oil spill is highly unpredictable, we expect sea turtles to be adversely affected by a major oil spill. Due to the lack of data of life history stages and the unpredictable location of a major oil spill occurring, we have made the assumption that hatchlings/juveniles and adult sea turtle have an equal chance of being affected by an oil spill; however, when the number of individuals taken is an odd number, we expect adults to have the slightly higher risk of tarball ingestion due to their generally greater amount of prey ingested than smaller individuals. We estimate the following take of sea turtles from a major oil spill occurring during the 40-year lifetime of the proposed action.

Species	Sheen		Tarball Ingestion	
	Lethal	Non-Lethal	Lethal	Non-Lethal
Hatchlings/Juveniles (0.50 lethal)				
leatherback	2	2	0	0
green	11	11	0	2
Kemps' ridley	8	7	0	1
loggerhead	35	34	0	7
Adults (0.10 lethal)				
leatherback	0	4	0	1
green	2	20	0	3
Kemps' ridley	1	7	0	1
loggerhead	7	62	0	8
hawksbill	0	0	0	1

Numbers greater than 0.50 have been rounded up to the nearest whole number. The risk of hawksbill sea turtles being is low, but spills occurring in south Texas may affect this species through tarball ingestion.

Sperm Whales

Although some sperm whales may be able to avoid oil spills or slicks following detection of hydrocarbons at the surface, it is highly unlikely that they are capable of avoiding spill residuals in their environment. Consequently, the probability that a marine mammal is exposed to hydrocarbons resulting from a spill extends well after the oil spill has dispersed, and may be exposed to residuals of oils spilled as a result of the proposed actions during their lifetimes, but the effects of these residuals is largely unknown. Although an interaction with a spill could occur, primarily sublethal effects are expected

due to avoidance and natural dispersion/weathering of the spill in the offshore environment or long-term exposure to hydrocarbons in the marine environment.

Based on the majority of oil production closer to shore and oil spills 75% of oil spills occurring within 3 nmi of the shoreline, there is a lower likelihood of sperm whales being exposed to oil slicks over the 40-year lifetime of the action. However, because spills are unpredictable events and sperm whales can be found throughout the GOM, it is likely at least one sperm whale will come into contact with a slick if a spill were to occur in an area being used by sperm whales at that time. Considering the density of sperm whales in the GOM (0.0035 individuals km^{-2}) and the spill area of a major oil spill sheen in Table 7 (3,108 km^2), we estimate the following take of sperm whales:

- 11 non-lethal takes of sperm whales over the 40-year lifetime of the action.

Gulf sturgeon
Due to benthic habits of Gulf sturgeon, their presence in marine waters only during the winter, and the low risk of an oil spill contacting them in only the western-most area of their range, there is a relatively low risk of exposure to oil. Because they are not known to do not breach the surface in estuarine and marine waters, an exposure analysis to the surface slick has not been conducted. However, based on the oil spill risk probability, some oil may be expected to come into contact with Gulf sturgeon habitat over the 40-year life of the proposed lease sales, and in NMFS opinion may affect some individuals due to weathering of the slick in nearshore environments along the coastline. In general, a surface slick would not be expected to adversely affect Gulf sturgeon due their benthic habits; however, NMFS expects that a slick reaching shallow coastal waters less than 15 feet may mix throughout the water column and potentially affect sturgeon. two Gulf sturgeon are likely to be lethally taken and another two non-lethally taken by an oil spill over the 40-year life of the proposed lease sales that affect shallow water environments where oil may mix throughout the water column. Although oil spills are unpredictable events, the OSRA indicates a 6 to 9 percent chance that a spill >42,000 gal would reach coastal waters of the westernmost portion of the Gulf sturgeon's range within 10 days. Due to the risk of oil spills on the fringe of Gulf sturgeon's range, we estimate the following:

- Two lethal takes of Gulf sturgeon over the 40-year lifetime of the proposed action.

8 CUMULATIVE EFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions, not involving federal activities, reasonably certain to occur within the action area considered in this biological opinion (i.e., the WPA and CPA of the GOM). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Cumulative effects may affect sea turtle species, Gulf sturgeon, sperm whales, and their habitats in the action area. The actions and their effects described as occurring within the action area in the *Environmental Baseline* are expected to continue in the future. We are not aware of any proposed or anticipated changes to these actions that would substantially change the impacts that each threat has on listed species considered by this biological opinion. Therefore, we expect the effects of these actions on listed species will continue at similar levels into the foreseeable future.

9 JEOPARDY ANALYSIS

This section considers the likelihood that the proposed five-year lease sale plan will jeopardize the continued existence of listed species in the wild that have been considered in the effects of the action. To *Jeopardize the continued existence of* is defined as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). The effects of the action considered the effects of vessel strikes on sea turtles, the effects of seismic exploration on sperm whales, and the effects of accidental oil spills on listed species of sea turtles, sperm whales, and Gulf sturgeon resulting from the proposed five-year lease sale plan. The following jeopardy analysis first considers the effects of the action to determine if we would reasonably expect the action to result in reductions in reproduction, numbers, or distribution of these listed species. The analysis next considers the effects of the action in light of the status of the species, the environmental baseline, and cumulative effects, to determine whether the likelihood of survival of each species in the wild, and the likelihood of recovery of each species in the wild, would be appreciably reduced.

9.1 Effects of the Action on the Likelihood of Survival in the Wild

This section analyzes the effects of the action on the likelihood of survival of each species in the wild. In this context, the survival of the species refers to the continued existence of the species in the wild, and whether or not any anticipated take of that species will result in any reduction in reproduction, numbers, or distribution of that species that may appreciably increase a species' risk of extinction in the wild.

Likelihood of Loggerhead Sea Turtle Survival

In the following analysis, we demonstrate that although some short-term reduction in numbers and reproduction is expected, the anticipated take of loggerhead sea turtles will not appreciably increase the risk of extinction of this species in the wild.

The non-lethal take of 238 individuals by vessel strike and 111 individuals by oil spill over the 40-year lifetime of the action could potentially result in short-term affects on individuals. Sea turtles are generally known to not avoid oil slicks, and are often found near oil and gas operations. Changes in distribution, even short-term, are not expected from non-lethal takes from oil spills. However, interactions with vessels may elicit startle or avoidance responses and the effects of the proposed lease sales may result in

temporary changes in behavior of sea turtles (minutes to hours) over small areas, but are not expected to reduce the distribution of any loggerhead sea turtles in the action area. Lethal takes by vessel strike or oil spill may occur anywhere throughout the GOM. The removal of 119 individuals by vessel strike and 42 individuals by oil spill is anticipated over 40 years of the proposed action. Because all the potential takes are expected to occur anywhere in the action area and sea turtles generally have large ranges in which they disperse, no reduction in the distribution of loggerheads is expected from the take of these individuals.

Although changes in distribution will not occur, there is some potential for the reproductive ability of non-lethally taken turtles to be affected due to the presence of nesting beaches within reach of potential oil spills. For example, if a nesting beach was affected by an oil slick, nesting ability or hatchling survival could potentially be affected for that year, but the individual is expected to survive and return to unimpeded reproduction in subsequent years. Some long-term, non-lethal effects to hydrocarbon residues from spills and ingestion of tarballs may affect sea turtle physiology. In spite of these effects, it appears non-lethal, chronic exposure or repeated ingestion of oil is necessary for any long-term affects to be detectable, yet no effects on the reproduction or number of sea turtles from long-term exposure to residuals or tarball ingestions have been observed in the wild. Non-lethal takes by vessel strike aren't expected to have any measurable impact on the reproduction of numbers of loggerheads. The reaction to and injury incurred from vessel impacts would be dependent on the operational speed of the vessel, depth of the turtle, bow type, and other factors. The non-lethal takes may range from startle reactions to minor injury, and are expected to recover within an appropriate amount of time, depending on the magnitude of impact. Although the range of impacts of non-lethal takes are variable, all are expected to be fully recoverable such that no reductions in reproduction or numbers of loggerheads are anticipated.

The removal of 119 individuals by vessel strike and 42 individuals by oil spill (approximately 4 individuals annually), would result in an instantaneous, but temporary reduction in total population numbers. Sea turtles lethally affected by vessels and spilled oil may be juveniles or adults, with about 2 adults and 3 juveniles every 1.5 years, of which half those adults would be mature females (about 33 adult females over the 40-year lifetime of the lease sales). Thus, the action will result in a reduction of loggerhead numbers. Sea turtle mortality resulting from vessel interactions or spilled oil could result in the loss of reproductive value of an adult turtle. An adult loggerhead sea turtle can lay 3 or 4 clutches of eggs every 2 to 4 years, with 100 to 130 eggs per clutch. The annual loss of 1.5 adult females, on average, could preclude the production of thousands of eggs and hatchlings, of which a small percentage are expected to survive to sexual maturity. Thus, the death of a female eliminates an individual's contribution to future generations, and the action will result in a reduction in loggerhead reproduction. Below, we consider the population trends for loggerhead sea turtles and the effect that the anticipated reduction in numbers and reproduction has on the survival of the species.

Five northwestern Atlantic loggerhead subpopulations have been identified (NMFS SEFSC 2001). The most recent reviews show that only two loggerhead nesting beaches

have greater than 10,000 females nesting per year: South Florida (U.S.) and Masirah Island (Oman). Total estimated nesting in the U.S. is approximately 68,000 to 90,000 nests per year. A yet-to-be-published analysis of nesting data from 1989-2005 by FWRI indicates there is a trend for declining nesting at beaches utilized by the south Florida nesting subpopulation (2006 FWRI letter (McRae) to NMFS, based on statewide nesting beach survey data analyzed by FWRI). Similarly, long-term nesting data show loggerhead nesting declines in North Carolina, South Carolina, and Georgia. Loggerhead populations in Honduras, Mexico, Colombia, Israel, Turkey, Bahamas, Cuba, Greece, Japan, and Panama have been declining.

In other regions, the Eastern Atlantic, the Cape Verde Islands support an intermediately-sized loggerhead nesting assemblage. In 2000, researchers tagged over 1,000 nesting females on just 5 km (3.1 mi) of beach on Boavista Island (Ehrhart et al. 2003). In the Western Atlantic (excluding the U.S.), published and unpublished reports provide an estimate of about 4,000 nests per year in Brazil (Ehrhart et al. 2003). In the Mediterranean, the recorded number of nests per year in Cyprus, Greece, Israel, Tunisia, and Turkey, loggerhead nesting in the Mediterranean ranges from about 3,300 to 7,000 nests per season (Margaritoulis et al. 2003). A small, but unknown nesting population size of loggerheads nest throughout the Indian Ocean.

All life stages are important to the survival of the species; however, it is important to note that individuals of one life stage are not equivalent to those of other life stages. Loggerhead sea turtles have very long developmental times before reaching maturity (up to 38 years). Individuals in earlier life stages are subject to many potential sources of mortality, both natural and human-induced, prior to reaching sexual maturity. Only a fraction of pelagic juveniles are ever expected to contribute to the population through reproduction, and thus are not as valuable to the population as a breeding age adult. The loss of a certain number of pelagic juveniles, therefore, is less of a threat to the species' survival compared to an equal loss of sexually-mature adults.

It is unclear at this time if the current data from major nesting beaches indicate a declining trend in total population size, or is the result of some other factor such as regional failure to nest by the reproductively mature females, variable recruitment resulting in a biased age structure in the population, environmental factors (e.g., resource depletion, nesting beach conditions, oceanographic conditions, etc.), or some natural variation in nesting patterns over time. Whether the decreased trend some subpopulations are currently experiencing are associated with affects these populations experienced decades ago, or is associated with some other variable currently affecting nesting numbers is unknown. How these nesting trends will change in the future is uncertain at this time and being analyzed by the TEWG. Although some natural variability is expected in nesting trends, recruitment of adults into the breeding population could potentially occur if this trend continues over the long-term.

The low number of expected loggerhead mortalities (approximately four individuals annually of different sex and age classes) is not detectable. Considering the population size in the Western North Atlantic, we believe the loggerhead population is sufficiently

large enough to persist and recruit new individuals to replace those expected to be taken. The TEWG (1998) estimated the total loggerhead population of benthic individuals in U.S. waters – a subset of the whole Western Atlantic population – at over 200,000. Based on this estimate, the mortality of 161 loggerheads (approximately 81 juveniles, 40 male adults, and 40 female adults) over the 40-year lifetime of the proposed action would be less than 0.0009% of the current total eastern U.S. population.

Although the anticipated mortalities would result in an instantaneous reduction in absolute population numbers, it is likely that the U.S. populations of sea turtles would not be appreciably affected considering the following. For a population to remain stable, sea turtles must replace themselves through successful reproduction at least once over the course of their reproductive lives, and at least one offspring must survive to reproduce itself. If the hatchling survival rate to maturity is greater than the mortality rate of the population, the loss of breeding individuals would be replaced through recruitment of new breeding individuals from successful reproduction of non-taken sea turtles. Although the causes of the declining trend of major nesting subpopulations are unknown at this time, the present population size is sufficiently large for the persistence of this species. This is evident in this analysis by the fact that loggerheads are expected to be taken in greater numbers than other species of sea turtles due to their higher abundance and densities in the GOM, despite the negative trend in nesting observed over the last several years. Although the declining numbers of major nesting subpopulations requires further study and analysis to determine the causes and long-term effects on population dynamics, the species' likelihood of survival in the wild will not be appreciably reduced as a result of this action..

Summary of Loggerhead Sea Turtle Survival
Based on the above analysis, we believe that the lethal and non-lethal takes of loggerhead sea turtles associated with the proposed action are not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of loggerhead sea turtles in the wild.

Likelihood of Leatherback Sea Turtle Survival
In the following analysis, we demonstrate that although some short-term reduction in numbers and reproduction is expected, the anticipated take of leatherback sea turtles will not appreciably increase the risk of extinction of this species in the wild.

The non-lethal take of 21 individuals by vessel strike and 7 individuals by oil spill over the 40-year lifetime of the action could potentially result in short-term affects on individuals. Sea turtles are generally known to not avoid oil slicks, and are often found near oil and gas operations. Changes in distribution, even short-term, are not expected from non-lethal takes from oil spills. However, interactions with vessels may elicit startle or avoidance responses and the effects of the proposed lease sales may result in temporary changes in behavior of sea turtles (minutes to hours) over small areas, but are not expected to appreciably reduce the distribution of leatherback sea turtles in the action area. Lethal takes by vessel strike or oil spill may occur anywhere throughout the GOM. The removal of 10 individuals by vessel strike and 2 individuals by oil spill is anticipated

over 40 years of the proposed action. Because all the potential takes are expected to occur anywhere in the action area and sea turtles generally have large ranges in which they disperse, no reduction in the distribution of leatherbacks is expected from the take of these individuals.

When considering the non-lethal effects of an oil spill, leatherbacks have the greatest potential to be affected by spills in pelagic environments. Nesting by leatherbacks in the GOM is sporadic and no major nesting beaches occur in this region. The habitat of leatherbacks in the GOM is typically found in deeper, offshore waters. Due to this habitat, they are typically less vulnerable to spills, of which 75 percent occur within 3 nmi of shore. Leatherbacks are deep divers foraging on prey in the water column and may ingest tarballs. Although some physiological effects may occur from exposure, they are expected to be inconsequential on reproduction. Non-lethal takes by vessel strike aren't expected to have any measurable impact on the reproduction of leatherbacks. The reaction to and injury incurred from vessel impacts would be dependent on the operational speed of the vessel, depth of the turtle, bow type, and other factors. The non-lethal takes may range from startle reactions to minor injury, and individuals are expected to recover within an appropriate amount of time, depending on the magnitude of impact. Although the range of impacts of non-lethal takes are variable, all are expected to be fully recoverable such that no reduction in reproduction or numbers of leatherbacks are anticipated.

A total of 10 leatherbacks are expected to be lethally taken by vessel strike and 2 by oil spill over the 40-year lifetime of the proposed lease sales (approximately 1 individual every 3.3 years, on average). Leatherbacks lethally taken by vessels and spilled oil may be juveniles or adults, with about 5 adults and 7 juveniles over a period of 40 years, of which half those adults would be mature females (about 2-3 adult females over the 40-year lifetime of the lease sales). Thus, the action will result in a reduction of leatherback numbers. The expected mortalities will eliminate an individual's contribution to future generations; thus, resulting in a reduction in reproduction. Below, we consider the population trends for leatherback sea turtles and the effect that the anticipated reduction in numbers and reproduction has on the survival of the species.

The Pacific Ocean leatherback population is generally smaller in size than that in the Atlantic Ocean. Because adult female leatherbacks frequently nest on different beaches, nesting population estimates and trends are especially difficult to monitor. In the Pacific, the World Conservation Union (IUCN) notes that most leatherback nesting populations have declined more than 80%. In other areas of the leatherback's range, observed declines in nesting populations are not as severe, and some population trends are increasing or stable. Nesting trends on U.S. beaches have been increasing in recent years. Leatherback nesting trends for individual beaches are considerably variable, dependent upon natural fluctuations in beach conditions throughout the Atlantic basin; therefore, basin-wide estimates may be a better indicator of population trends than nesting data trends for individual beaches. Spotila et al. (2001) estimated that the mean population number of leatherbacks in the Atlantic basin totaled approximately 27,600 nesting

females (20,082-35,133). We believe that the current population probably still lies within this range, taking into account the natural variation at individual nesting beaches.

Similar to the discussion of the relative importance of various life stages in the loggerhead section above, the removal of different age classes or sexes has different consequences on the population of leatherbacks as well. According to Spotila et al. (1996), survivorship in the juvenile/sub-adult stage of leatherback sea turtles is vitally important to the future of the species; population models are most sensitive to variation in juvenile/sub-adult survival. The number of individuals in the various stages would also not be as disparate in leatherbacks as in loggerheads. Assuming an equal chance or mortality for both juveniles and adults, only 2-3 adult female leatherbacks would be expected to be removed from the population over 40 years. Although the death of a female eliminates an individual's contribution to future generations and may result in a reduction in reproduction, the low number of lethal takes for leatherbacks from the proposed action indicates a greater chance of successful breeding or replacement of individuals through recruitment.

For example, if a leatherback successfully nested in a single nesting season and only one of those hatchlings survived to maturity to breed, there would be no net gain or loss to population numbers. Increasing numbers of hatchlings surviving to maturity would result in a net increase in population numbers, as long as the overall recruitment rate exceeds the death in the population. If a mature female leatherback were taken prior to successful nesting and recruitment of an individual to the breeding population, a net decrease in population size of that individual would be incurred. However, a net loss is not expected. Although the mortality of a few individuals would have an instantaneous decease in absolute population numbers at the time of taking, based on the population size and increasing nesting trend in recent years, the mortality of 12 individuals over 40 years is expected to have a negligible impact on population numbers. Even assuming all mortalities would consist of nesting females, based on the lower female nesting population estimate of 20,084 individuals in the Atlantic, the removal of 12 individuals would be <0.0007 of the total population. The replacement of these 12 individuals through recruitment of new individuals into the breeding population; by at least 12 sea turtles producing at least 2 offspring that survive to adulthood to reproduce, is expected in a population of this size. The expected mortality of leatherbacks is not expected to appreciably reduce the species' likelihood of survival in the wild.

Summary of Leatherback Sea Turtle Survival

Based on the above analysis, we believe that the lethal and non-lethal takes of leatherback sea turtles associated with the proposed action are not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of leatherback sea turtles in the wild.

Likelihood of Kemp's Ridley Sea Turtle Survival

In the following analysis, we demonstrate that although some short-term reduction in numbers and reproduction is expected, the anticipated take of Kemp's ridley sea turtles will not appreciably increase the risk of extinction of this species in the wild.

The non-lethal take of 26 individuals by vessel strike and 16 individuals by oil spill over the 40-year lifetime of the action could potentially result in short-term affects on individuals. Sea turtles are generally known to not avoid oil slicks, and are often found near oil and gas operations. Changes in distribution, even short-term, are not expected from non-lethal takes from oil spills. However, interactions with vessels may elicit startle or avoidance responses and the effects of the proposed lease sales may result in temporary changes in behavior of sea turtles (minutes to hours) over small areas, but are not expected to reduce the distribution of any Kemp's ridley sea turtles in the action area. Lethal takes by vessel strike or oil spill may occur anywhere throughout the GOM. The removal of 13 individuals by vessel strike and 9 individuals by oil spill is anticipated over 40 years of the proposed action. Because all the potential takes are expected to occur anywhere in the action area and sea turtles generally have large ranges in which they disperse, no appreciable changes in the distribution of Kemp's ridleys is expected from the take of these individuals.

Although changes in distribution will not occur, there is some potential for the reproductive ability of non-lethally taken turtles to be affected due to the presence of nesting beaches within reach of potential oil spills. For example, if a nesting beach was affected by an oil slick, nesting ability or hatchling survival could potentially be affected for that year, but the individual is expected to survive and return to unimpeded reproduction in subsequent years. Although oil spills are unpredictable, historical spill data show that large spills are uncommon in the GOM, and spill response plans to protect coastal resources reduce the likelihood that spills will affecting nesting beaches. Some long-term, non-lethal effects to hydrocarbon residues from spills and ingestion of tarballs may affect sea turtle physiology. In spite of these effects, it appears non-lethal, chronic exposure or repeated ingestion of oil is necessary for any long-term affects to be detectable, yet no effects on the reproduction or number of sea turtles from long-term exposure to residuals or tarball ingestion have been observed in the wild. Non-lethal takes by vessel strike aren't expected to have any measurable impact on the reproduction or numbers of Kemp's ridleys. The reaction to and injury incurred from vessel impacts would be dependent on the operational speed of the vessel, depth of the turtle, bow type, and other factors. The non-lethal takes may range from startle reactions to minor injury, and are expected to recover within an appropriate amount of time, depending on the magnitude of impact. Although the range of impacts of non-lethal takes are variable, all are expected to be fully recoverable such that no reductions in reproduction or numbers of Kemp's ridley sea turtles are anticipated.

A total of 13 Kemp's ridleys are expected to be lethally taken by vessel strike and 9 individuals by oil spills over the 40-year lifetime of the proposed lease sales (approximately 1 individual every 2.2 years, on average). Thus, the action will result in a reduction of Kemp's ridley numbers. The expected mortalities will eliminate an individual's contribution to future generations; thus, resulting in a reduction in reproduction. Below, we consider the population trends for Kemp's ridley sea turtles and the effect that the anticipated reduction in numbers and reproduction has on the survival of the species.

The total population of Kemp's ridleys is not known, but nesting has been increasing significantly in the past several years (9 to 13 percent per year) with a trajectory that should meet or exceed recovery goals. Kemps' ridleys mature and nest at an age of 7-15 years, which is earlier than other chelonids. A younger age at maturity may be a factor in the response of this species to recovery actions. A period of steady increase in benthic immature ridleys has been occurring since 1990 and appears to be due to increased hatchling production and an apparent increase in survival rates of immature sea turtles beginning in 1990. The increased survivorship of immature sea turtles is attributable, in part, to the introduction of turtle excluder devices (TEDs) in the United States and Mexican shrimping fleets and Mexican beach protection efforts. The TEWG (2000) projected that Kemp's ridleys could reach the Recovery Plan's intermediate recovery goal of 10,000 nesters by the year 2015.

Similar to the discussion of the relative importance of various life stages in the loggerhead section above, the removal of different age classes or sexes has different consequences on the population of Kemp's ridleys as well. Lethal takes by vessel strike or oil spill may occur at random anywhere throughout the GOM, are will not affect the distribution of this species in any way. Kemp's ridleys taken by vessels and spilled oil may be juveniles or adults, with an estimated 8 adults every 5 years, of which half those adults would be mature females (about 1 adult female every 10 years, or approximately 4 females over the 40-year lifetime of the lease sales).

All life stages are important to the survival and recovery of the species; however, it is important to note that individuals of one life stage are not equivalent to those of other life stages. Individuals in earlier life stages are subject to many potential sources of mortality, both natural and human-induced, prior to reaching sexual maturity. Only a fraction of pelagic juveniles are ever expected to contribute to the population through reproduction, and thus are not as valuable to the population as a breeding age adult. Sea turtle mortality resulting from vessel interactions or spilled oil could result in the loss of reproductive value of an adult turtle. The loss of 1 adult females every 10 years, on average, could preclude the production of thousands of eggs and hatchlings, of which a small percentage are expected to survive to sexual maturity. However, the population of Kemp's ridleys is increasing and the removal of these individuals is not expected to have any detectable impact on population numbers in the wild. The proportional change in overall survival of Kemp's ridleys from the loss of one individual every two years would be insignificant. The number of younger sea turtles recruiting into the adult or subadult population and their future potential reproductive value would quickly exceed the incidental take of these individuals and its future reproductive value.

Based on the above analysis, the anticipated lethal take of 22 individuals on the population would not be expected to be detectable.

Summary of Kemp's Ridley Sea Turtle Survival

Based on the above analysis, we believe that the lethal and non-lethal takes of Kemp's ridley sea turtles associated with the proposed action are not reasonably expected to

cause, directly or indirectly, an appreciable reduction in the likelihood of survival of Kemp's ridley sea turtles in the wild.

Likelihood of Green Sea Turtle Survival

In the following analysis, we demonstrate that although some short-term reduction in numbers and reproduction is expected, the anticipated take of green sea turtles will not appreciably increase the risk of extinction of this species in the wild.

The non-lethal take of 76 individuals by vessel strike and 36 individuals by oil spills over the 40-year lifetime of the action could potentially result in short-term effects in the fitness of individuals. Sea turtles are generally known to not avoid oil slicks, and are often found near oil and gas operations. Changes in turtle distribution, even short-term, are not expected from oil spills. However, interactions with vessels may elicit startle or avoidance responses and the effects of the proposed lease sales may result in temporary changes in behavior of sea turtles (minutes to days) over small areas, but are not expected to reduce the distribution of any green sea turtles in the action area. Lethal takes by vessel strike or oil spill may occur anywhere throughout the GOM. The removal of 38 individuals by vessel strike and 13 individuals by oil spill is anticipated over 40 years of the proposed action. Because all the potential takes are expected to occur anywhere in the action area and sea turtles generally have large ranges in which they disperse, no reduction in the distribution of green sea turtles is expected from the take of these individuals.

Although changes in distribution will not occur, there is some potential for the reproductive ability of non-lethally taken turtles to be affected due to the presence of nesting beaches within reach of potential oil spills. For example, if a nesting beach was affected by an oil slick, nesting ability or hatchling survival could potentially be affected for that year, but the individual is expected to survive and return to unimpeded reproduction in subsequent years. Although oil spills are unpredictable, there are no green sea turtle nesting beaches likely to affected by oil spills resulting from the proposed action. Some long-term, non-lethal effects to hydrocarbon residues from spills and ingestion of tarballs may affect sea turtle physiology. In spite of these effects, it appears non-lethal, chronic exposure or repeated ingestion of oil is necessary for any long-term effects to be detectable, yet no effects on the reproduction or number of sea turtles from long-term exposure to oil residuals or tarball ingestions have been observed in the wild. Non-lethal takes by vessel strike are not expected to have any measurable impact on the reproduction or numbers of green sea turtles. The reaction to and injury incurred from vessel impacts would be dependent on the operational speed of the vessel, depth of the turtle, bow type, and other factors. The non-lethal takes may range from startle reactions to minor injury, and turtles are expected to recover within an appropriate amount of time, depending on the magnitude of impact. Although the range of impacts of non-lethal takes is variable, all impacts are expected to be fully recoverable from such that no effects to reproduction or numbers of green sea turtles are anticipated.

The lethal take of 38 green sea turtles by vessel strikes and 13 individuals by oil spills over a period of 40 years of the proposed action (1.3 individuals per year, on average)

would result in an instantaneous decrease in absolute population numbers for that year, albeit an undetectable decrease. Thus, the action will result in a reduction of green sea turtle numbers. The expected mortalities will eliminate an individual's contribution to future generations; thus, resulting in a reduction in reproduction. Below, we consider the population trends for green sea turtles and the effect that the anticipated reduction in numbers and reproduction has on the survival of the species.

The two largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica, and Raine Island, on the Great Barrier Reef in Australia, where an annual average of 22,500 and 18,000 females nest per season, respectively. In the U.S., green turtles nest primarily along the central and southeast coast of Florida; present estimates range from 200-1,100 females nesting annually. The total population of green turtles is not known, but nesting activity in Florida and the major Caribbean nesting beach at Tortuguero, Costa Rica, has increased over the long-term and populations are stable or increasing.

All life stages are important to the survival and recovery of the species; however, it is important to note that individuals of one life stage are not equivalent to those of other life stages. Individuals in earlier life stages are subject to many potential sources of mortality, both natural and human-induced, prior to reaching sexual maturity. Only a fraction of pelagic juveniles are ever expected to contribute to the population through reproduction, and thus are not as valuable to the population as a breeding age adult. Sea turtle mortality resulting from vessel interactions or spilled oil could result in the loss of reproductive value of an adult turtle. The loss of 7-8 adult females over the 40-year lifetime of the proposed action (1 female every 5-6 years), could preclude the production of thousands of eggs and hatchlings, of which a small percentage are expected to survive to sexual maturity. However, the proportional change in overall survival of green sea turtles from the loss of one female every 5-6 years would be insignificant. The number of younger sea turtles recruiting into the adult or subadult population and their future potential reproductive value would quickly exceed the incidental take of these individuals and its future reproductive value.

The 51 takes over the 40-year lifetime of the proposed action is not expected to result in any detectable change in the population's growth rate. Recruitment into the population is expected to replace these individuals, allowing the species to quickly recover from this relatively small number of deaths annually. The removal of a low number of individuals of these species is not expected to appreciably reduce the likelihood of the survival of green sea turtles in the wild.

Summary of Green Sea Turtle Survival

Based on the above analysis, we believe that the lethal and non-lethal takes of green sea turtles associated with the proposed action are not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of green sea turtles in the wild.

Likelihood of Hawksbill Sea Turtle Survival

In the following analysis, we demonstrate that although some short-term reduction in numbers and reproduction is expected, the anticipated take of hawksbill sea turtles will not appreciably increase the risk of extinction of this species in the wild.

The non-lethal take of 1 individual by vessel strike and 1 individual by oil spill over the 40-year lifetime of the action could potentially result in short-term affects on individuals. Sea turtles are generally known to not avoid oil slicks, and are often found near oil and gas operations. We anticipate 1 individual may be struck and killed by a vessel impact over the 40-year lifetime of the proposed action. The numbers of non-lethal and lethal takes of hawksbill sea turtles are low, a total of 3 over the 40 lifetime of the action. Because such a small number of animals are expected to be taken (1 individual every 13.3 years, on average), no reduction in the distribution of hawksbill sea turtles is expected from lethal and non-lethal takes.

The non-lethal take of 1 individual by vessel strike and 1 individual by oil spills (tarball ingestion) over the 40-year lifetime of the action could potentially result in short-term effects in the fitness of individuals. Adult foraging habitat, which may or may not overlap with developmental habitat, is typically coral reefs, although other hard-bottom communities and occasionally mangrove-fringed bays may be occupied. Although hawksbills may occasionally be expected to be found in the action area, this species' habitats are found mainly along peninsular Florida and Mexico, and they are expected to be of low density and rare in the action area. Despite their rarity, 1 turtle may have a risk of ingesting tarballs due to the persistence of tarballs after a slick has dissipated. Non-lethal takes by vessel strike are not expected to have any measurable impact on the reproduction or numbers of hawksbill sea turtles. The reaction to and injury incurred from vessel impacts would be dependent on the operational speed of the vessel, depth of the turtle, bow type, and other factors. The non-lethal takes may range from startle reactions to minor injury, and turtles are expected to recover within an appropriate amount of time, depending on the magnitude of impact. Although the range of impacts of non-lethal takes is variable, all impacts are expected to be fully recoverable from such that no reduction in reproduction or numbers of hawksbill sea turtles are anticipated.

The lethal take of one hawksbill by vessel strike is expected over the 40-year lifetime of the proposed action. Thus, the action will result in a reduction of hawksbill numbers. If the animal lethally taken were a female, a reduction in reproduction may be incurred. Below, we consider the population trends for hawksbill sea turtles and the effect that the anticipated reduction in numbers and reproduction has on the survival of the species.

Hawksbills are solitary nesters and, thus, determining population trends or estimates on nesting beaches is difficult. Hawksbills are not common in the action area, but solitary turtles have been occasionally sighted in shallow, coastal waters. Within the continental U.S., nesting is restricted to the southeast coast of Florida and the Florida Keys, but nesting is rare in these areas. The largest populations of hawksbills are found in the Caribbean, the Republic of Seychelles, Indonesia, and Australia. The most significant nesting within the U.S. occurs in Puerto Rico and the U.S. Virgin Islands, specifically on

Mona Island and Buck Island, respectively. Each year, about 500-1000 hawksbill nests are laid on Mona Island, Puerto Rico (Díez and van Dam 2006) and another 100-150 nests on Buck Island Reef National Monument off St. Croix in the U.S. Virgin Islands. Nesting also occurs on other beaches in St. Croix and on St. John, St. Thomas, Culebra Island, Vieques Island, and mainland Puerto Rico. In addition to nesting beaches in the U.S. Caribbean, hawksbills nest at numerous other sites throughout the Caribbean, with the majority of nesting occurring in Mexico and Cuba. In Mexico, about 2,800 hawksbills nest in Campeche, Yucatán, and Quintana Roo each year (Spotila 2004). Lutz et al. (2003) estimate the number of adult hawksbills living in the Caribbean today is 27,000. In the Pacific, the largest nesting population of hawksbills appears to occur in Australia with approximately 2,000 hawksbills nest on the northwest coast of Australia and about 6,000 to 8,000 off the Great Barrier Reef each year (Spotila 2004).

In spite of their low potential to be affected in the action area, a potential exists for one hawksbill sea turtle to be lethally taken over the 40-year lifetime of the proposed action. There is a 50% probability the individual could be an immature or mature female sea turtle. Even if a single female hawksbill sea turtle were removed from the population, the effects on the size and reproductive value to the population would not be detectable.

Summary of Hawksbill Sea Turtle Survival
Based on the above analysis, we believe that the lethal and non-lethal takes of hawksbill sea turtles associated with the proposed action are not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of hawksbill sea turtles in the wild.

Likelihood of Gulf Sturgeon Survival
In the following analysis, we demonstrate that although some short-term reduction in numbers and reproduction is expected, the anticipated take of Gulf sturgeon will not appreciably increase the risk of extinction of this species in the wild.

Although some lethal takes from oil spills are expected, oil floats and is expected to impact the environment for short periods of time; therefore, oil spills are not expected to result in any reduction in the distribution of Gulf sturgeon. Takes are expected to occur in the GOM, rather than rivers, and are therefore potentially expected to effect reproductive fish. Two individual Gulf sturgeon are anticipated to be lethally taken by oil spills over the 40-year lifetime of the proposed action; thus, the action will result in a reduction in numbers and reproduction for Gulf sturgeon. Below, we consider the population trends for Gulf sturgeon and the effect that the anticipated reduction in numbers and reproduction has on the survival of the species.

Gulf sturgeon occur in most major tributaries of the northeastern GOM, from the Mississippi River east to Florida's Suwannee River, and in the central and eastern nearshore Gulf waters as far south as Charlotte Harbor, Florida. While little is known about the abundance of Gulf sturgeon throughout most of its range, population estimates have been calculated for the Apalachicola (115 individuals), Choctawhatchee (2,000 to 3,000 individuals), and Suwannee Rivers (7,650 individuals). Genetic studies show that

Gulf sturgeon exhibit river-specific fidelity. Based on analysis of oil spills occurring within the range of Gulf sturgeon, the two lethal takes of Gulf sturgeon expected would occur for fish native to Lake Pontchartrain/Pearl River subpopulation, for which no population numbers have been conducted.

Although no population estimates are available for the Lake Pontchartrain/Pearl River subpopulation, the range-wide decline in the Gulf sturgeon population appears to have been arrested primarily by closing the state fisheries in the 1980s. However, because the Gulf sturgeon is a long-lived, late maturing animal, it is probable that the species requires numerous generations to achieve long-term population stability assuming that adequate habitat is available. For instance, in the Suwannee River, where sub-population numbers appear to be the greatest (approximately 7,600 individuals), only 30 to 90 females spawn in any given year. Because the affected fish are expected to be taken in the GOM, and not in spawning rivers, the two sturgeon takes are expected to be adults. The removal of two adults could potentially affect the number of reproductive individuals available in that year the take occurred. Factors to consider include the sex of the animals taken, and if females, whether or not the individuals were spawning that year. However, due to the low number of expected takes, we believe the expected removal of two individuals by oil spill over 40 years of the proposed action will not result in any detectable effect on the population, and this species will continue to persist in the wild.

Summary of Gulf Sturgeon Survival
Based on the above analysis, we believe that the lethal takes of Gulf sturgeon associated with the proposed action are not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of Gulf sturgeon in the wild.

Likelihood of Sperm Whale Survival
In the following analysis, we demonstrate that although some short-term reduction in numbers and reproduction is expected, the anticipated take of sperm whales will not appreciably increase the risk of extinction of this species in the wild.

Harassment of sperm whales resulting from seismic surveys is not expected to result in a reduction of numbers, reproduction, or distribution of sperm whales in the wild. Although historical abundances of sperm whales in the GOM are unavailable, recent abundance estimates based on surveys (Mullin and Fulling 2003) indicated that the sperm whale population in the GOM is stable (1,349 whales). Estimates of the global sperm whale population indicate numbers exceeding at least 200,000 individuals is likely and the population appears to be recovering from the large numbers of individuals removed by whaling, the primary threat resulting in this species' listing. The GOM population is comprised of mostly a female population and calves. The effects of oil on sperm whales in this area could be on females and immature animals of either sex. Any exposure to spilled oil is expected to be limited to temporary exposure to volatile compounds in the form of oil at the surface or vapors. Although some temporary avoidance of a spill may result, no reduction in the distribution of sperm whales would result. The non-lethal takes from oil exposure are not expected to result in any reduction in numbers of reproduction of sperm whales.

Summary of Sperm Whale Survival
Based on the above analysis, we believe that the non-lethal takes of sperm whales associated with the proposed action are not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of sperm whales in the wild.

9.2. Effects of the Action on the Likelihood of Recovery in the Wild

The above analysis on the effects of the action on the likelihood of each species' survival in the wild considered the current status of each species and effects of the numbers of lethal and/or non-lethal takes anticipated for each species. For species in which no reductions in the species numbers, reproduction, or distribution were found, we concluded no change in the species survival would be incurred. For species in which the analysis concluded expected reductions in the number, reproduction, or distribution of the species, the effect of those reductions was analyzed to determine whether those reductions would appreciable reduce the likely survival of the species. Although no appreciable change in distribution was concluded for any species, we concluded lethal takes would result in an instantaneous reduction in absolute population numbers that may also reduce reproduction, but the short-term reductions are not expected to appreciable reduce the likelihood of survival of any species in the wild. The following analysis considers the effects of the take on the likelihood of recovery in the wild. We consider the recovery objectives in the recovery plans prepared for each species that relate to population numbers or reproduction that may be affected by any reductions in the numbers, reproduction, or distribution resulting from the take of each species.

Likelihood of Loggerhead Sea Turtle Recovery
The Atlantic recovery plan for the United States population of the loggerhead sea turtles (NMFS and USFWS 1991a), herein incorporated by reference, lists the following relevant recovery objective over a period of 25 continuous years:

- The adult female population in Florida is increasing and in North Carolina, South Carolina, and Georgia, it has returned to pre-listing nesting levels (NC = 800 nests/season; SC = 10,000 nests/season; GA = 2,000 nests/season).

The 161 lethal takes of loggerhead sea turtles over a period of 40-years (approximately 4 lethal takes annually) will result in a reduction in overall population numbers in any given year. One-quarter of these takes are expected to be adult females and may effect reproduction (approximately 1 adult female every 1.6 years or 66 adult females over 40 years of the proposed action). We have already determined these takes are not likely to reduce population numbers over time due to current population sizes and expected recruitment. Non-lethal takes of loggerhead sea turtles by vessel strikes or oil spill (8.7 non-lethal takes annually, on average, or 349 non-lethal takes over a period of 40 years) will not affect the adult female nesting population or number of nests per nesting season. When considering no anticipated effects on nesting and the fact that oil spills associated with the proposed action will not affect any of the nesting beaches listed in the recovery objective above, non-lethal takes will not result in an appreciable reduction in the likelihood of loggerhead sea turtle recovery in the wild.

Likelihood of Leatherback Sea Turtle Recovery
The Atlantic recovery plan for the United States population of the leatherback sea turtles (NMFS and USFWS 1992), herein incorporated by reference, lists the following relevant recovery objective;

- The adult female population increases over the next 25 years, as evidenced by as statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, USVI, and along the east coast of Florida.

The lethal removal of 13 individuals (one individual every 3.1 years) will result in the instantaneous reduction in overall population numbers in any given year of the take occurring. Six of these takes are expected to be adult females. We have already determined these takes are not likely to reduce population numbers over time due to current population sizes and expected recruitment. The effects of this reduction in population numbers are not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of leatherback sea turtle recovery in the wild. Takes of leatherback sea turtles by vessel strikes or oil spill are not anticipated to reduce the adult female nesting population or number of nests. Accidental oil spills in the GOM will not affect any of the nesting beaches listed in the recovery objective above.

Likelihood of Kemp's Ridley Sea Turtle Recovery
The recovery plan for Kemp's ridley sea turtles (USFWS and NMFS 1992), herein incorporated by reference, lists the following relevant recovery objective:

- Attain a population of at least 10,000 females nesting in a season.

The lethal removal of 18 individuals (approximately one lethal take every 2.2 years) will result in the instantaneous reduction in overall population numbers in any given year of a take occurring. About 1 adult female every 10 years is expected to be lethally taken, or approximately 4 females over the 40-year lifetime of the lease sales. We have already determined these takes are not likely to reduce population numbers over time due to current population sizes and expected recruitment. Takes of Kemps ridley sea turtles by vessel strikes or oil spill will not affect the number of nesting females in any given nesting season. Thus, the proposed action will not result in an appreciable reduction in the likelihood of Kemp's ridley sea turtle recovery in the wild.

Likelihood of Green Sea Turtle Recovery
The Atlantic recovery plan for the population of green sea turtles (NMFS and USFWS 1991b), herein incorporated by reference, lists the following relevant recovery objectives over a period of 25 continuous years:

- The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years.

- A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

The 51 lethal takes of green sea turtles over a period of 40 years (approximately 1.3 lethal takes annually, on average) will result in the instantaneous reduction in overall population numbers in any given year. We have already determined these takes are not likely to reduce population numbers over time due to current population sizes and expected recruitment. About 11 of these takes are expected to be adult females (approximately 1 adult female and 1 juvenile every 3.6 years). No age class will be more at risk than another, and the removal of 1 juvenile every 1.3 years is not anticipated to result in any detectable effects on counts of juveniles on foraging grounds. Takes of green sea turtles by vessel strikes or oil spill will not affect either of the above recovery objectives, since neither the level of nesting nor age class mortality effects will result. Thus, the proposed action will not result in an appreciable reduction in the likelihood of green sea turtle recovery in the wild.

Likelihood of Hawksbill Sea Turtle Recovery

The recovery plan for the population of the hawksbill sea turtles (NMFS and USFWS 1993), herein incorporated by reference, lists the following relevant recovery objectives over a period of 25 continuous years:

- The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests at five index beaches, including Mona Island and BIRNM.

- The numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, USVI, and Florida.

We have already determined the small number of takes (1 lethal and two non-lethal) are not likely to reduce population numbers over time due to current population sizes and expected recruitment. The effect of the small number of takes over 40 years will not affect either of the above recovery objectives. The take of hawksbill sea turtles is not anticipated to result in an appreciable reduction in the likelihood of hawksbill sea turtle recovery in the wild.

Likelihood of Gulf Sturgeon Recovery

The recovery plan for the Gulf sturgeon (USFWS et al. 1995), herein incorporated by reference, lists the following relevant recovery objective:

- Defining a self-sustaining population as one where the average rate (over a 12-year period) of natural recruitment is at least equal to the average mortality rate.

The incidental take of two Gulf sturgeon over the 40-year life of the proposed action, even if occurring in the same year, is not expected to change the population dynamics of the population. Although there is a chance the individuals taken may be reproductive females, the effects of this small reduction in numbers and reproduction is not anticipated to affect the natural recruitment of individuals into the population, and these mortalities

are expected to be replaced through recruitment such that this recovery objective is not impeded. The effect of the lethal take of two individuals over 40 years is not anticipated to result in an appreciable reduction in the likelihood of Gulf sturgeon recovery in the wild.

Likelihood of Sperm Whale Recovery

Although a final recovery plan has not been prepared for sperm whales, a draft plan was recently updated that identifies the following relevant recovery criteria for sperm whales:

- A probability of extinction of <1 percent in 100 years, achieved in part by a stable or increasing population for at least 80 years (or 3 generations).

No lethal takes of sperm are anticipated from this action; therefore, the non-lethal take of 11 sperm whales will not result in an appreciable reduction in the likelihood of sperm whale recovery in the wild.

9.3 Synthesis of Likelihood of Survival and Recovery in the Wild

Conclusions for Sea Turtles

The proposed lease sales will not appreciably reduce the likelihood of the survival and recovery in the wild of any of the five species of sea turtles considered in this biological opinion. We conclude that the anticipated reduction in numbers by take of sea turtles by vessel strikes and oil spills associated with the proposed action, when evaluated in the context of each species' status, the environmental baseline, and the cumulative effects, are not expected jeopardize the continued existence of loggerhead, leatherback, Kemp's ridley, green, or hawksbill sea turtles.

Conclusions for Gulf Sturgeon

The proposed lease sales will not appreciably reduce the likelihood of the survival and recovery of Gulf sturgeon. We conclude that the anticipated reduction in numbers by take of Gulf sturgeon by oil spills associated with the proposed action, when evaluated in the context of the species' status, the environmental baseline, and the cumulative effects, will not affect Gulf sturgeon in a way that reduces the number of fish born in a particular year (i.e., a specific age-class), the reproductive success of adults, or the number of young annually recruited into the adult breeding population. It is our opinion the proposed action will not jeopardize the continued existence of Gulf sturgeon.

Conclusions for Sperm Whales

The proposed lease sales will not appreciably reduce the likelihood of the survival and recovery of sperm whales. We conclude that the anticipated reduction in numbers by take of sperm whales by oil spills associated with the proposed action, when evaluated in the context of the species' status, the environmental baseline, and the cumulative effects, will not jeopardize the continued existence of sperm whales.

10 CONCLUSION

We have analyzed the best available data, the current status of the species, environmental baseline, effects of the proposed action, and cumulative effects to determine whether the proposed action is likely to jeopardize the continued existence of any sea turtle species, Gulf sturgeon or sperm whales. The proposed action will not appreciably reduce the likelihood of survival and recovery of the listed species considered in this biological opinion. After reviewing the status of leatherback, loggerhead, green, hawksbill, and Kemp's ridley sea turtles; the threatened Gulf sturgeon; endangered sperm whales, and analyzing the synthesis of the environmental baseline, the effects of the proposed action, and the cumulative effects, it is the biological opinion of NMFS that implementation of the proposed action described in this biological opinion is not likely to jeopardize the continued existence of these species.

11 INCIDENTAL TAKE STATEMENT (ITS)

Section 9 of the ESA and protective regulations issued pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the RPMs and terms and conditions of the ITS.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the MMPA. Since no incidental take of listed marine mammals is expected or has been authorized under section 101(a)(5) of the MMPA, no statement on incidental take of endangered whales is provided and no take is authorized. Nevertheless, MMS must immediately notify (within 24 hours, if communication is possible) the NMFS' Office of Protected Resources should a take of a listed marine mammal occur.

Take of Sperm Whales

Sperm whales within the action area are likely to be adversely affected by seismic activities. Seismic activities are likely to disrupt the normal behavior of marine mammals but measures included in NTL No. 2007-G02 should reduce the impact of that disruption so that it does not rise above the level of harassment (i.e., injury or mortality is not anticipated). Any vessel collisions with sperm whales are likely to severely harm or kill the animal but measures included in NTL No. 2007-G04 should reduce the risk of collision with sperm whales to a discountable level. However, NMFS is not including an incidental take statement for the incidental take of whale species because the take of marine mammals has not been authorized under section 101(a)(5)(A) of the Marine

Mammal Protection Act (MMPA) and/or its 1994 amendments (See ESA section 7(b)(4)(C)).

On December 26, 2002, the MMS submitted a request for 5-year regulations under the MMPA for the taking, by harassment, of sperm whales incidental to the oil and gas industry's seismic surveys to discover oil and gas deposits offshore in the GOM. NOAA Fisheries published an Advance Notice of Proposed Rulemaking regarding the small take authorization on March 3, 2003 (68 FR 9991). Following issuance of such regulations under the MMPA, NMFS will amend this opinion to include any authorized incidental take of sperm whales, as may be appropriate at that time.

Take of Sea Turtles Resulting from Vessel Strikes

NMFS expects impacts to sea turtles in the action area as a result of OCS oil and gas leasing activities. Based on stranding records, incidental captures during recreational and commercial fishing operations, scientific surveys, and historical data, the five species of sea turtles are known to occur in GOM waters in and around the action area. The vessel strike avoidance requirements (NTL No. 2003-G10) will appreciably reduce the numbers of sea turtles that may be incidentally taken from routine offshore vessel operations associated with the proposed action; however, the available information on the relationship between these species and OCS oil and gas activities indicates that sea turtles may be killed or injured by vessel strikes as a result of the proposed action. Therefore, pursuant to section 7(b)(4) of the ESA, NMFS anticipates incidental take as follows:

- 119 lethal (2.9 individuals annually, on average) and 238 non-lethal takes (5.9 individuals annually, on average) of loggerhead sea turtles over the 40-year lifetime of the proposed action.

- 10 lethal takes (1 individual every 4 years, on average) and 21 non-lethal takes (1 individual every 1.9 years, on average) of leatherback sea turtles over the 40-year lifetime of the proposed action.

- 13 lethal takes (1 individual every 3 years, on average) and 26 non-lethal takes (1 individual every 1.5 years, on average) of Kemp's ridley sea turtles over the 40-year lifetime of the proposed action.

- 38 lethal takes (1 individual every 1.1 years, on average) and 76 non-lethal takes (1.9 individuals annually, on average) of green sea turtles over the 40-year lifetime of the proposed action.

- 1 lethal and 1 non-lethal take of a hawksbill sea turtle over the 40-year lifetime of the proposed action.

If the actual incidental take exceeds this level, MMS must immediately reinitiate formal consultation.

Takes of Listed Species Resulting from Spilled Oil

NMFS believes that a small number of listed species will experience adverse effects as the result of exposure to a major oil spill or ingestion of accidentally spilled oil over the lifetime of the action. Spilled oil resulting from the proposed action could take up to 42 lethal and 111 non-lethal takes of loggerheads; 2 lethal and 7 non-lethal takes of a leatherback sea turtles; 9 lethal and 16 non-lethal takes of Kemp's ridley sea turtles; 13 lethal and 36 non-lethal take of green sea turtles; 2 lethal takes of Gulf sturgeon; and 11 non-lethal takes of sperm whales over the 40-year lifetime of the proposed lease sales. However, NMFS is not including an incidental take statement for the incidental take of listed species due to oil exposure. Incidental take, as defined at 50 CFR 402.02, refers only to takings that result from an otherwise lawful activity. The Clean Water Act (33 USC 1251 *et seq.*) as amended by the Oil Pollution Act of 1990 (33 USC 2701 *et seq.*) prohibits discharges of harmful quantities of oil, as defined at 40 CFR 110.3, into waters of the United States. Therefore, even though this biological opinion has considered the effects on listed species by oil spills that may result from the proposed action, those takings that would result from an unlawful activity (i.e., oil spills) are not specified in this Incidental Take Statement and have no protective coverage under section 7(o)(2) of the ESA.

11.1 Effect of the Take

NMFS believes that the aforementioned level of anticipated take (lethal, or non-lethal) is not likely to appreciably reduce the likelihood of the survival and recovery of sperm whales; leatherback, green, hawksbill, Kemp's ridley, and loggerhead sea turtles; and Gulf sturgeon in the wild by reducing their reproduction, numbers, or distribution.

11.3 Reasonable and Prudent Measures (RPMs)

Section 7(b)(4) of the ESA requires NMFS to issue a statement specifying the impact of any incidental taking to any agency whose proposed action is found to comply with section 7(a)(2) of the ESA and whose proposed action may incidentally take individuals of listed species. It also states that RPMs necessary and appropriate to minimize impacts, and terms and conditions to implement those measures, must be provided and must be followed to minimize those impacts. Only incidental taking by the federal agency or applicant that complies with the specified terms and conditions is authorized.

The RPMs and terms and conditions are specified as required by 50 CFR 402.14 (i)(1)(ii) and (iv) to document the incidental take by the proposed action and to minimize the impact of that take on sea turtles. These measures and terms and conditions are non-discretionary, and must be implemented by NMFS in order for the protection of section 7(o)(2) to apply. NMFS has a continuing duty to regulate the activity covered by this incidental take statement. If MMS fails to adhere to the terms and conditions of the incidental take statement through enforceable terms, and/or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

NMFS has determined that the following RPMs are necessary and appropriate to minimize impacts of the incidental take of sea turtles from vessel operation.

1. MMS must reduce the potential for sea turtles to be struck and injured by vessels operating in support of oil and gas development activities in the GOM.

2. MMS must require the monitoring and reporting of any sea turtles struck or observed to have sign of vessel interaction to assess the actual level of incidental take in comparison with the anticipated incidental take.

11.4 Terms and Conditions

In order to be exempt from liability for take prohibited by section 9 of the ESA, NMFS must comply with the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary.

The following terms and conditions implement RPM No. 1.

1. MMS must implement NMFS measures to reduce the risk of accidental vessel strikes with sea turtles by use of its legal authorities to ensure implementation of, and compliance with NTL No 2007-G04 (APPENDIX A).

The following terms and conditions implement RPM No. 2.

2. MMS must make information available to vessel operators concerning species information on sea turtles in the GOM and reporting of vessel-struck, or injured and dead animals.

3. MMS must ensure that all vessel struck, or injured or dead turtles with indications of vessel interactions are reported to the Sea Turtle Stranding Network Coordinator in the nearest coastal state. Any takes of listed species shall be reported to the NMFS Southeast Regional Office within no more than 24 hours of the incident to: takereport.nmfsser@noaa.gov. If an MMS action is responsible for the injured or dead animals (e.g., because of a vessel strike), the MMS shall require the responsible parties to assist the respective salvage and stranding network as appropriate. Report dead or injured protected species to your local stranding network contacts. A list of sea turtle stranding responders is available at http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp. A list of marine mammal stranding network responders for each state is available at http://www.nmfs.noaa.gov/pr/health/networks.htm.

4. MMS must submit an annual report to NMFS Southeast Regional Office regarding the reports of vessel-struck sea turtles, and injured and dead sea turtles reported from oil and gas operators. Hardcopies of all annual reports will be submitted to the following address:

Assistant Regional Administrator for Protected Resources
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, FL 33701

12 CONSERVATION RECOMMENDATIONS

Under Section 20 of the OCSLA, the Secretary shall ". . . conduct such additional studies to establish environmental information as he deems necessary and shall monitor the human, marine, and coastal environments of such area or region in a manner designed to provide time-series and data trend information which can be used for comparison with any previously collected data for the purpose of identifying any significant changes in the quality and productivity of such environments, for establishing trends in the area studied and monitored, and for designing experiments to identify the causes of such changes." Through the Environmental Studies Program (ESP), MMS conducts studies designed to provide information on the current status of resources of concern and notable changes, if any, resulting from OCS Program activities.

Pile Driving

To better understand the cumulative effects of noise from oil and gas construction and development activities on the OCS, MMS should conduct a study to characterize all aspects of noise-producing construction and operation activities such as pile driving during well construction and platform installation, and of other common OCS activities. The study should characterize both specific sources of noise from MMS-permitted actions, as well as ambient noise measurements on the OCS. Major noise-producing activities should be identified and measurements of noise from these activities should be recorded and reported in appropriate units of measurement to estimate the acoustic footprint of the activities, duration, frequency, and relative contribution to ambient noise levels in the GOM. Methodologies of field measurements should be should be coordinated with NMFS personnel. Such data would help quantify the relative contribution of pile driving on ambient noise levels, compare to other known sources, and conduct cumulative impact analyses in the GOM. Following completion of such a study, MMS should hold a joint MMS/NMFS workshop with industry representatives to cooperatively discuss the results of the study and identify any technology- or method-based recommendations to reduce ambient noise in the marine environment, and any other future actions that may be necessary.

Observer Programs

MMS should work cooperatively with NMFS to address existing protected species observer issues in the GOM. Observers are currently required for geophysical and geological exploration and the explosive removal of offshore structures. Some current issues involve standard protocols passive acoustic monitoring, observer qualifications and training, standard reporting formats, and improvement in communicating with observers companies regarding the intent and protocols to be followed for protected species mitigation.

Marine Debris
MMS should continue to work with NMFS and the Offshore Operators Committee to provide informational materials to the offshore oil and gas workers, require annual training, and continue to develop best management practices to reduce the release of debris into the marine environment. MMS should work with NMFS to update the Marine Debris NTL 2003-G11, as appropriate.

Protected Species Workshops
On June 15-16, 1999, MMS hosted a Marine Protected Species Workshop in New Orleans, LA. MMS, in concert with appropriate agencies and with assistance in funding by industry where possible, should continue efforts in supporting work to carry out the recommendations of that workshop panel. MMS should continue its support of research to determine effects of OCS related activities on protected species, other marine fauna, and the environment, and present the results at its information transfer meetings.

13 REINITIATION OF CONSULTATION

This concludes formal consultation on the CMPR fishery. As provided in 50 CFR 402.16, reinitiation of formal consultation is required if discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of the taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat (when designated) in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, MMS must immediately request reinitiation of formal consultation.